Industrial QUALITY CONTROL

Vol. XII, No. 3
SEPTEMBER, 1955

QUALITY
through
Scientific Methods

Journal of the
AMERICAN SOCIETY FOR QUALITY CONTROL

NUMBER FOUR IN A SERIES

Air Gaging for Automation

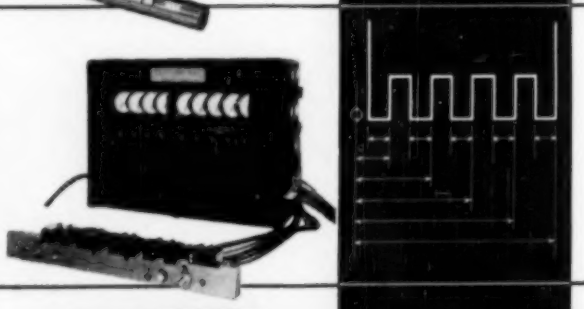
Some Taft-Peirce CompAIRator Air Gage Installations for mass production quality control...

Size Control on Automatic Lathe

This T-P Air-Electric CompAIRator is attached to an automatic lathe. As parts approach tolerance limits, gaging unit sends an electrical impulse to machine, which advances or retracts cutting tool to keep parts in optimum size range. If a part is produced outside the tolerance limits, unit shuts down the machine.

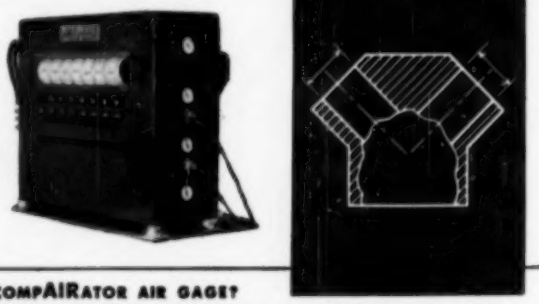
Size Control at Milling Machine

This T-P Air-Electric CompAIRator checks locations and widths of the main bearings of automotive cylinder blocks. 9 dials and lights indicate 5 bearing locations and 4 widths simultaneously. When any location or width is out of tolerance, unit automatically stops milling machine. Light indicates off-size dimension, dial reports exact size.



Size Control in Transfer Machine

This T-P Air-Electric CompAIRator checks 8 cylinder bore diameters simultaneously in V-8 automotive engine blocks. Automatically gages the diameter of the entire length of each bore. If any bore is out of tolerance, a light points it out, and production line is automatically shut down at completion of gaging cycle. Tolerance: .002".



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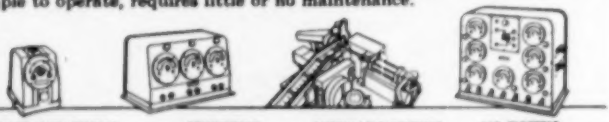
WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.



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Industrial Quality Control

Vol. XII **SEPTEMBER, 1955** **No. 3**

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IT PAYS . . . III

In the two previous editorials we have developed the dual themes that advertising is a beneficial social force contributing significantly to the American standard of living and that it is an equally beneficial industrial force contributing among other things to the better performance of your job, provided of course you use it.

There remains a third important theme: The relation of advertising to each of us as members of the American Society for Quality Control.

The truth is that this relation is a two-way street. Our membership on June 30, 1955 was 8780. As a group we represent a valuable market which industrial advertisers want to reach. This they can best do advertising in *Industrial Quality Control*. As our membership continues to grow in size and influence, our value as an advertising market improves, more advertisers will want to reach us.

The other direction in the street is that the Society could not begin to offer you *Industrial Quality Control* in its present form as one of its services if it weren't for the advertising. Advertising is the life-blood that enables ASQC to bring you 40-page issues every month. As the advertising increases so will the amount of technical material we can publish.

The benefits on this two-way street go hand-in-hand. As we sell more advertisers on IQC, you receive more advertising and technical information. This improves your value to your own and other companies and indirectly assists in the growth of the Society. Growth of ASQC gives us more to offer prospective advertisers; they become actual advertisers in IQC. This increase in advertising enables a further increase in editorial material and so the cycle is completed, ending up at a higher level.

Last year when IQC went to a monthly schedule we also began an extensive advertising promotion campaign. What all this adds up to is that each of us should regard the success of this campaign as his own personal concern. As you can see, it is.

There are two concrete ways in which you can do this.

Whenever your company investigates or purchases equipment and materials as a result of an ad you saw in IQC, be sure to indicate this in your inquiry or purchase order. Naming IQC as the source is most important because these inquiries are the real, tangible evidence to the advertiser that his use of IQC is justified. He must be able to trace directly the results of his advertising in IQC.

The second thing you can do depends on whether your company is itself a manufacturer of industrial products. If so, your company should be advertising its products to other members of ASQC. Bring IQC to the attention of your advertising or sales promotion manager. (Many are not aware that *Industrial Quality Control* is the only magazine that reaches quality control engineers exclusively.) Ask him to contact either the business office here in Milwaukee or one of our representatives whose names and addresses are on page 2. Better yet send his name along to us and we can forward the market data he needs.

Our advertising campaign needs your personal help to close this gap. You can contribute vitally by taking appropriate action in the two directions we have specified: Bring to the attention of potential advertisers the value of IQC as an ideal medium and actively support these ads at every opportunity.

—GRF

OUR COVER

This month's cover picture is thru the courtesy of Minneapolis-Honeywell Regulator Co. It shows one section of their thermostat assembly line on which continuous sampling with a "traffic light" system is used for quality control of the line. The inspector in the foreground uses varying colored lights to inform the workers of the quality of the instruments on the conveyor line. The informative article on continuous sampling begins on page 4.

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After initial adjustments are made, as in photograph, "Mr. Meticulous" automatically performs critical operations in making junction tetrode transistors—tiny experimental devices which may find important uses in the telephone system.

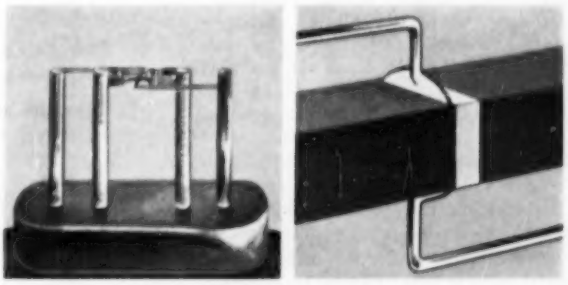
The machine we call "Mr. Meticulous"

Bell Laboratories scientists, who invented the junction transistor, have now created an automatic device which performs the intricate operations required for the laboratory production of experimental model transistors.

It takes a bar of germanium little thicker than a hair and tests its electrical characteristics. Then, in steps of 1/20,000 of an inch, it automatically moves a fine wire along the bar in search of an invisible layer of positive germanium to which the wire must be connected. This layer may be as thin as 1/10,000 of an inch!

When the machine finds the layer, it orders a surge of current which bonds the wire to the bar. Then it welds the wire's other end to a binding post. Afterward, it flips the bar over and does the same job with another wire on the opposite side!

Once only the most skilled technicians could do this work, and even their practiced hands became fatigued. This development demonstrates again how Bell Telephone Laboratories scientists work in every area of telephony to make service better.



Transistor made by new machine is shown in sketch at left above, magnified 6 times. At right is sketch of area where wires are bonded. The wires are 2/1000 inch in diameter, with ends crimped to reduce thickness.

BELL TELEPHONE LABORATORIES

IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES CAREERS FOR CREATIVE MEN IN MECHANICAL ENGINEERING

Continuous Sampling at Minneapolis-Honeywell

LAWRENCE ALBRECHT
HAROLD GULDE
ALAN MacLEAN
PAUL THOMPSON

Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota

INTRODUCTION

Continuous sampling is an inspection technique in which inspection is continuous during production and is located as an element of a line producing a continuous flow of product. There is no accumulation of product for inspection lots and no interruption of the flow of product on the line by inspection as long as the line is producing a product of acceptable quality. A conveyorized production line would be an ideal place for continuous sampling to be used.

The inspection function of controlling outgoing quality to predetermined quality requirements has for some time in industry been carried out through the use of lot sampling. This method, however, has the disadvantage of requiring the accumulation of product into lots for inspection, and provision of additional storage area at inspection. A great disadvantage of lot inspection is the time lag between production of the product and determination of inspection results. Quality information is often received too late to have any effect on the quality of present production.

We started using continuous sampling because we had to have a type of inspection which would not interrupt the flow on a conveyor line. Continuous sampling is adapted to conveyor production and eliminates the two problems of lot-by-lot inspection discussed above. Simple, easily preventable defects are caught as they first appear, so that corrective action can be taken before the defect is built into several hundred devices. This is one way that the number of defective instruments may actually be reduced under continuous sampling. By giving the line up-to-date information as the instruments are being produced, our continuous sampling method keeps operating personnel informed on how they are doing. Our method has resulted in improved line quality, lower salvage and sorting costs, and fewer production interruptions.

TYPES OF CONTINUOUS SAMPLING PLANS

There are two main types of continuous sampling. The better known type is the Dodge plan, under which the following procedure is used:

1. To start with, inspect 100 per cent of the units consecutively produced and continue such inspection until i units in succession are found free of defects.
2. When i units in succession are found free of defects, discontinue 100 per cent inspection and inspect only a fraction f of the units, selecting individual sample units one at a time from the flow of product. Each sample item must be selected in a random fashion.
3. If a defect is found while sampling, revert to a 100 per cent check and continue on 100 per cent checking until i units in succession are found free of defects.

Dodge has two later plans which do not revert to 100 per cent inspection when the first defective unit is found while sampling.

The second type of continuous sampling was introduced by Wald and Wolfowitz. Girshick has made some changes and adjustment to this type of continuous sampling. The continuous sampling plans used at Honeywell are based on the work of Girshick.

Our plan operates as follows:

1. Start sampling immediately, selecting one unit out of k units produced.
2. Plot the results of inspection on a sequential sampling chart.
3. Continue sampling until
   a. Plotted points on sequential chart cross the accept line. At this point the line quality is considered acceptable, and the sampling process is, therefore, continued on a new chart.
   b. Plotted points cross the reject line. Line quality is then considered unacceptable.
4. If rejection has taken place, a lot of size i, which is a 100 per cent good lot, must be produced to dilute the poor material sent out just before rejection.
5. Once the 100 per cent lot has been produced (this may take several tries if quality is not greatly improved) we can return to sampling inspection using the sequential chart. Whenever a rejection has taken place, no units are passed by inspection until the 100 per cent lot has been accepted.

ADVANTAGES OF GIRSHICK PLAN

This plan enables one to use the advantages of sequential sampling which is the most efficient type of inspection in most cases. A sequential plan will generally involve less inspection than single or double sampling to hold the same OC curve.

The sequential chart can be easily divided into warning areas. The operating department usually knows when the line is in difficulty a long time before actual rejection. Quick remedial action can often prevent rejection.

It is easy to use when there is a large number of possible defects, as with visual inspection. Any plan which reverted to 100 per cent inspection on the finding of a defect would not be too useful to us.

This plan lends itself easily to the use of critical, major, and minor defect categories being checked at the same time. There is no complicating procedure. Either one is on sampling or 100 per cent inspection on each of the categories. This relatively simple procedure makes the plan easy to administer. We have made adjustments in the plan so that we can have an inspection force of constant size at all times. Most continuous plans involve bringing in extra inspection personnel at times of rejections.

A big advantage of Girshick's plan is that it holds the AOQL no matter what quality comes to inspection or whether the process is under control or not.

DESCRIPTION OF SEQUENTIAL SAMPLING

Most of us know what single sampling involves. A random sample of specified size is taken and an allow-

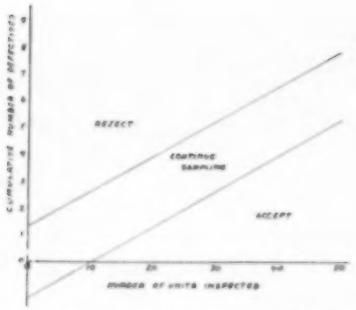


Figure 1—Example of a Sequential Chart

able number of defects c are permitted in the sample. If more than c defects are found, the lot is rejected for sorting. A decision is usually not made until the entire sample is checked. (Occasionally we stop checking when the c number is exceeded.)

With a sequential plan a decision is made after each piece is inspected. We either accept, reject, or continue sampling. This decision is reached by means of a chart. (See Fig. 1.) The three areas on the graph have been explained before. The tightness of the plan is determined by the position of the diagonal lines. The four quantities α, β, p_1, and p_2 uniquely determine the position of the lines. These four values define the AQL and OQL (objectionable quality level) points on the OC curve. (See Fig. 2.) Once the plan has been set up, the AOQL is also set. The sharper the OC curve, the further apart are the diagonal lines. The more severe a plan desired (for example on criticals,) the lower the intercept of the upper diagonal line with the vertical axis and the less the slope of the lines. The inspection procedure under continuous sampling is identical to the above described method. The only difference is in the action taken when rejection takes place. In lot-by-lot sequential, the rejected lot is sorted. In continuous sampling, all material up to the point of rejection is passed but the next material of size i units must be good.

FORMULAS FOR CONTINUOUS SAMPLING

The equation of the upper diagonal line is

$$d = h_2 + sn$$

where

h_2 = the intercept of the line with the vertical axis

s = slope of the line

n = number of units inspected

d = cumulative number of defects.

The equation of the lower diagonal line is

$$d = h_1 + sn$$

where

h_1 = the intercept of the line with the vertical axis

s, n, and d are the same as above.

There are two new equations which are used with continuous sampling which are not found in ordinary sequential sampling.

1. $$AOQL = \frac{k-1}{k} s$$

where

AOQL = Average Outgoing Quality Limit

k = the segment size from which one item is drawn

s = slope of the lines as defined above.

2. $$i = \frac{h_2}{s} k$$

where

i = the size of the 100 per cent good lot

h_2, s and k are as defined above.

The values of k and i must be specified for a continuous plan as well as α, β, p_1 and p_2 for the sequential chart. We have developed charts to obtain a desired plan with very few calculations. We usually let $\alpha = \beta =$ five per cent. Using equal values for α and β has two advantages:

1. The values of h_2 and h_1 are the same size but of opposite sign.
2. The OC curve for sequential is much easier to calculate.

SETTING UP THE CONTINUOUS SAMPLING PLAN

Determining the Quality Requirements

The possible defects must be classified into critical, major and minor categories and the quality requirements set for each. The value of $\bar{p}$ of the line for each class of defect must be obtained from past data. It should also be determined if the values of $\bar{p}$ are stable. The information on these two points will show how often rejection can be expected to take place. However, it often happens that just putting in a continuous plan may actually lower $\bar{p}$ so much that really poor quality lines may change into lines which rarely reject.

The AQL and AOQL levels, which are satisfactory to the customer and to company personnel, must be worked out. Such things as field returns, past history of quality, and the best estimates of desirable quality to send into the field must be considered before setting the AQL and AOQL.

Setting the Factors of the Plan

The number of instruments that an inspector can normally inspect in a day and the production rate per day must be known in order to arrive at a value for k. The maximum 100 per cent lot size which can be handled should be determined to set the factor i approximately.

The following method is used to obtain the exact values of the factors of the plan.

1. Assume one desires the following plan:

   AOQL = 4 per cent

   $\alpha = \beta =$ 5 per cent

   p_1 = AQL = 1 per cent

   k = 10.

   Using the chart for k, i, AOQL, and AQL, we find that we need

   i = 260. (See Fig. 3.)

2. Use the formula for AOQL = $\frac{k-1}{k} s$ to approximate s.

   In this case s = 0.04444.

3. Use the Continuous Sampling Chart for p_1 vs. p_2 vs. s to obtain an approximate value of p_2. In this case $p_2 = 11.8$ per cent. (See Fig. 4.)

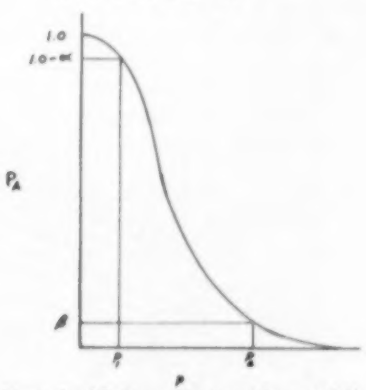
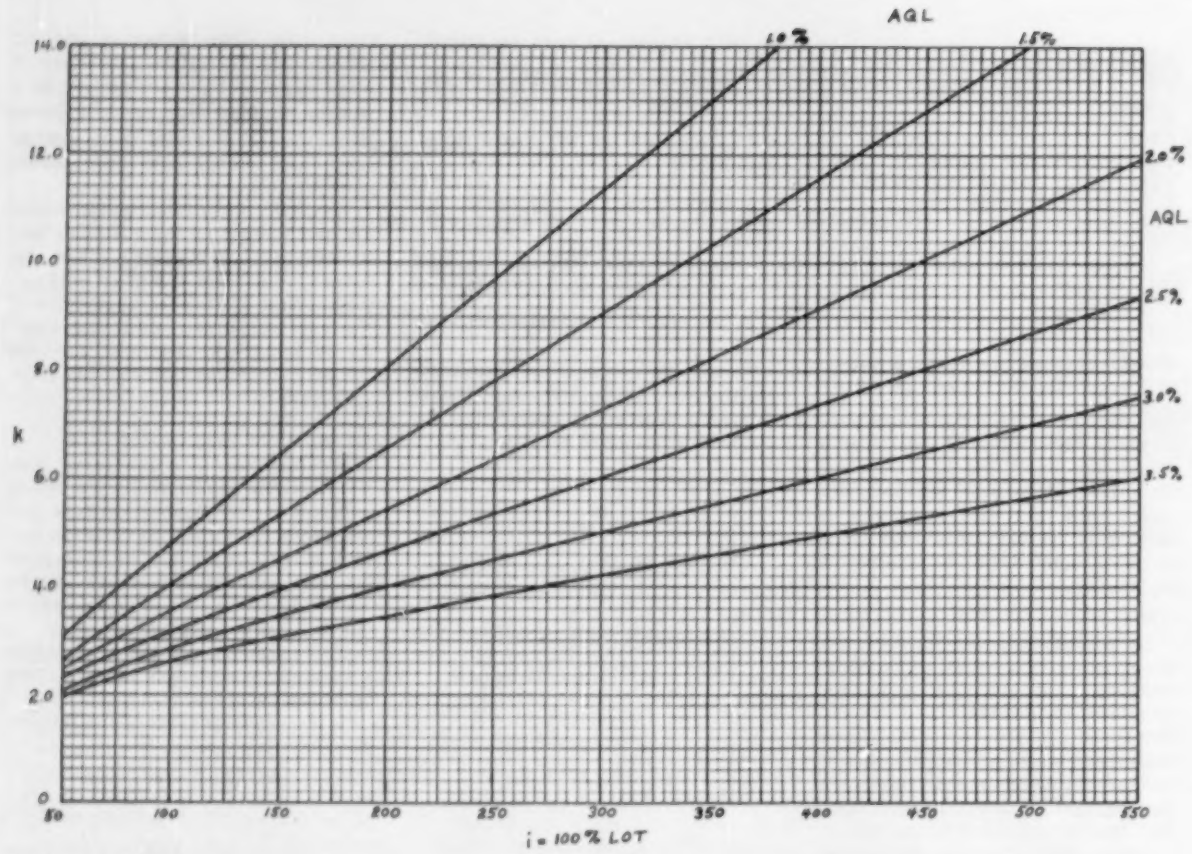
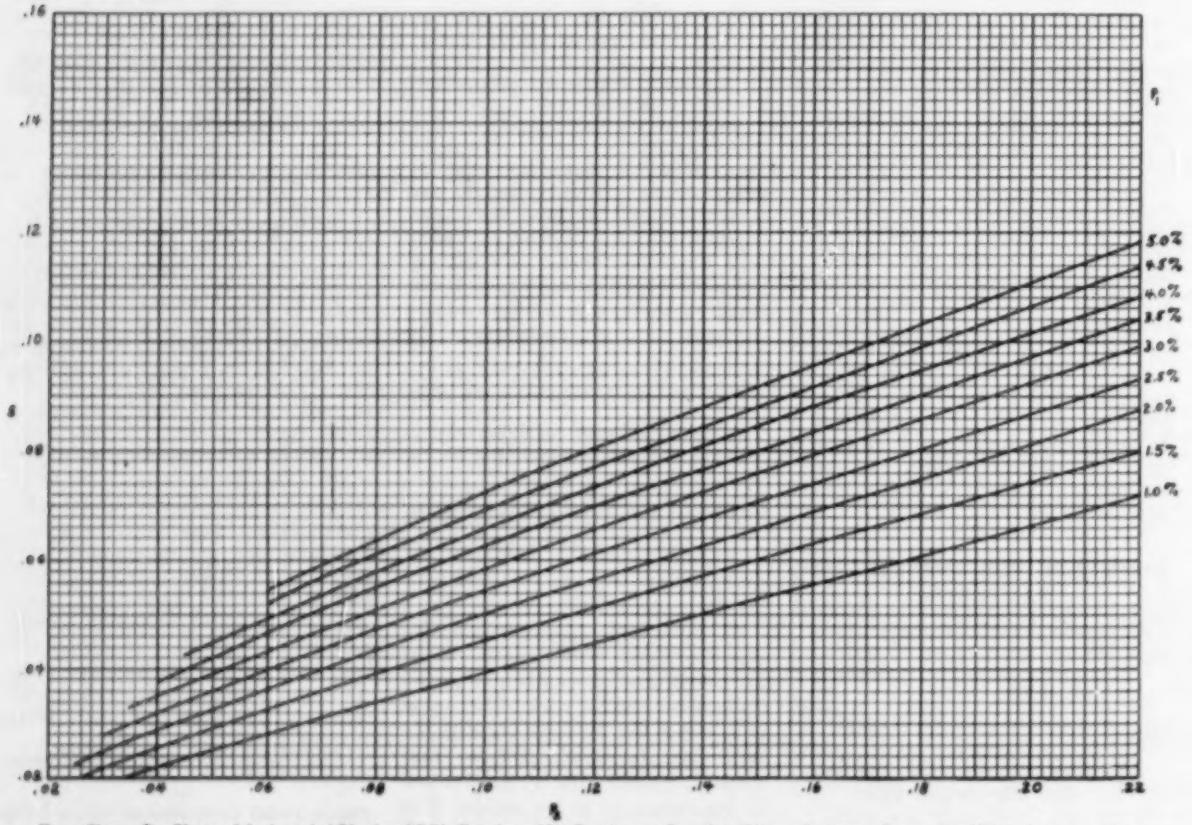


Figure 2—OC Curve Showing AQL and OQL Points





Top. Figure 3—Chart of k, i, and AQL, for AOQL Equal to 4% Continuous Sampling Plans. Bottom. Figure 4—Chart of p'_1, p_0 and s

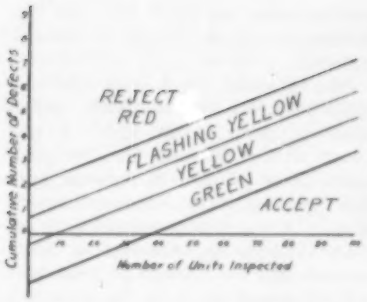


Figure 5—Example of a Sequential Chart Showing Warning Areas

4. The value of h_2 may be obtained from the usual sequential formula

$$h_2 = \frac{\log \frac{1-\beta}{\alpha}}{\log \frac{p_2}{p_1}\left(\frac{1-p_1}{1-p_2}\right)}$$

(note: since $\alpha = \beta$, then $h_1 = -h_2$.) The values of h_2 and s enable one to draw the sequential chart.

5. These approximate values of s and p_2 are close enough for usual purposes. To be very accurate, one can take the given k, α, β, and p_1 together with the calculated p_2 and actually calculate s and i.

The Use of Lights to Inform Everyone of the Status of the Line

We have arbitrarily set up regions between the accept and reject regions as warning areas. Position on the chart is indicated constantly by displaying a light corresponding to the position of the plotted points on the chart. (See Fig. 5.)

The nondecision area is divided into three regions. We try to have the flashing yellow region at least one defective wide. The green and yellow regions are usually of equal size. The inspector has a switch at her desk which she uses to switch on lights which are similar to traffic lights. These lights tell everyone on the floor the quality of the line. This light system also lets supervision know when their efforts are needed on the line to help clear up problems before serious trouble develops.

Preparing the Production Line

A clear procedure must be available to the inspector indicating the defects to be checked for. We use three separate simultaneous plans on the units produced. One is for criticals, one is for majors, and one is for minors. The constants for these plans naturally differ with only k being the same on all three.

There is also some equipment which should be obtained. Counters are needed to indicate to inspectors the production at any moment. This helps the inspector know when to select another instrument to inspect.

There should be space on the line for an inspection station. A light system which can be controlled at the inspector's desk is also very helpful.

Conditions Required for Continuous Sampling

Production should be at a fairly high rate. We use continuous sampling on lines with production as low as 300 units a week and as high as 40,000 a week. The higher the production the better.

There should be no uncontrollable problems on the line. It should be possible for production personnel to take corrective action when defects occur.

Process control should be set up at the subassembly stages. Process control and continuous sampling go hand-in-hand. Data from final inspection may be used for process control charts. Whenever possible, by using p charts or other means, operators should be informed of the results of their work. When some aspect of the final assembly gives trouble, this information can be used as a basis for planning process control at the point in manufacture where the defect originates.

DEPARTURES FROM THEORY

In sequential sampling a new chart is usually started at the zero point after the previous lot was accepted. This works out fine when dealing with lot-by-lot inspection. There is no past history when we start inspecting a lot. However, on a continuous plan when the line is accepted, we often follow up along the accept line with the points rather than return to a zero point. This permits use of a chart for a longer production period and avoids unnecessarily penalizing the production line when a new chart is started. Rather than start a new chart at zero (and thus nearer the reject area), the first point on the new chart is plotted the same distance from the reject line as was the last point on the old chart. We start at zero only when a new line is put under continuous sampling or after a 100 per cent lot has been passed. All of this means that there is no ending of the sequential process once it is started unless the reject line is reached.

We do not correct defective units immediately and replace them on the line. These units are given to the group leader of the line who takes them back to the operator responsible for the defect. Normally the corrected unit then comes through with the new production.

Another adjustment that is made is in the checking of the 100 per cent lot. As soon as a rejection occurs, the operating department starts sorting their work very carefully. We not only depend on this, but throw a very tight sample check behind production. The sampling rate continues at the same level as before (one in ten for example.) In the unrejected categories normal checking and plotting are carried on. The rejected category is checked on the very tight plan. For example, if i = 360 and k = 10, then 36 units would be checked with no defectives allowed.

APPLICATIONS AND RESULTS OBTAINED

The results of some applications at Honeywell show how well continuous sampling has worked as an approach to cost reduction and quality improvement. We made the first application of continuous sampling on our motor lines in April 1953. These had long been a difficult area both as to quality and production. A conveyor line had been tried several years previously but had been unsuccessful largely due to the pile up of rejected lots. We tried conveyor line operation here again but with continuous sampling this time. The results have been very satisfactory. Hours required to build 1000 good units were reduced from 1660 to 1378, a reduction of 17 per cent. With continuous sampling in use, the line consistently made schedule for the first time in almost a year. Quality improved so that we saved $143 in salvage per 1000 units to stock. This comparison is based

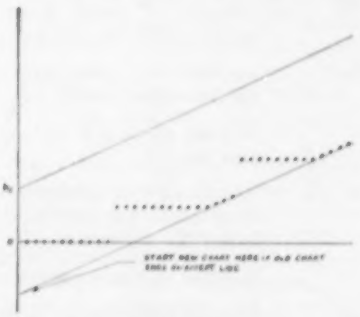


Figure 6—Example of the Adjustment in the Sequential Chart Following the Acceptance of the Process

on a three month period before and a three month period after the continuous-sampling installation.

Another application of continuous sampling was made on a high production thermostat line. Production was changed to a conveyorized continuous flow line as a result of methods and layout improvements made. As on the motor lines, continuous sampling was the quality control technique needed in order that the company might realize the full advantages of this continuous process. As a result of these changes, production was increased 40 percent with no increase in personnel. Total hours to produce 1000 good thermostate were reduced from 279.6 to 182.5. Salvage labor was reduced from 39.5 to 11.8 hours per 1000 good units. Total critical and major defects went down from four percent to 0.7 percent. The total estimated annual savings for this one line alone are $133,000.

Results have been favorable on all lines where we have applied this continuous sampling approach. We have found that it promotes better team work between operating, methods, time study and inspection personnel. Those responsible for production like this approach to quality control and are asking for more of it.

GLOSSARY

α — Probability of rejecting a lot of quality p_1

AOQ — Average outgoing quality

AOQL — Average outgoing quality limit

AQL — Acceptable quality level

β — Probability of accepting a lot of quality p_2

d — Cumulative number of defects on the sequential chart

E(n) — Average sample number

h_1 — Intercept of lower diagonal line with vertical axis

h_2 — Intercept of upper diagonal line with vertical axis

i — Number of units in 100 per cent lot

k — Segment of production from which one unit is selected for inspection

n — Number of items inspected

p — Percent defective on line

p_1 — Acceptable quality level = AQL

p_2 — Objectionable quality level = OQL

P_A — Probability of acceptance

s — Slope of lines on sequential chart

MATHEMATICAL APPENDIX

Sequential Formulas

The inspection procedure outlined above is identical with sequential lot-by-lot inspection. The only difference is in the action taken when rejection has taken place. The following sequential sampling formulas hold.

1.
$$h_1 = \frac{-\log \frac{1-\alpha}{\beta}}{\log\left[\frac{p_2}{p_1}\left(\frac{1-p_1}{1-p_2}\right)\right]},$$

2.
$$h_2 = \frac{\log \frac{1-\beta}{\alpha}}{\log\left[\frac{p_2}{p_1}\left(\frac{1-p_1}{1-p_2}\right)\right]},$$

3.
$$s = \frac{\log \frac{1-p_1}{1-p_2}}{\log\left[\frac{p_2}{p_1}\left(\frac{1-p_1}{1-p_2}\right)\right]},$$

4. If $\alpha = \beta$,
$$p = \frac{\left(\frac{P_A}{1-P_A}\right)^{s/h} - 1}{\left(\frac{P_A}{1-P_A}\right)^{1/h} - 1},$$
where $h = h_2 = -h_1$, p remains in control at a specified level,

5.
$$E(n) = \frac{P_A(h_2 - h_1) - h_2}{s - p},$$
where E(n) is the average sample number before crossing an acceptance or rejection line, and p remains in control at a specified level.

Formula for Average Outgoing Quality (AOQ)

The average outgoing quality of a plan may be figured from the expected number of defective units which have passed inspection divided by the number of units sent to stock during the same period. In the following calculations it is assumed that defective units found during inspection are corrected and put back on the line. Also the 100 percent lot is assumed to be free of defects.

The expected number of defective units sent out from the start of inspection until a decision on the chart is reached and the 100 percent lot is passed, if necessary, is $p(k-1)E(n)$. This statement shows that p, the percent defective, times $(k-1)E(n)$, the number of units passed but not actually inspected during sampling, gives the expected number of defective units in stock. The expected number of units sent to stock during the same period of time is $kE(n) + (1 - P_A)\frac{h_2}{s}k$. The first factor gives the units sent to stock during sampling and the second factor gives the expected number of units sent to stock during the 100 percent check. Therefore the AOQ of the plan is given by

$$AOQ = \frac{p(k-1)E(n)}{kE(n) + (1-P_A)\frac{h_2}{s}k},$$

Formula for Average Outgoing Quality Limit (AOQL)

In this type of continuous sampling the AOQ is always less than the AOQL but approaches it asymptotically as p approaches 100 percent. To find the AOQL let p = 100 percent. If p is equal to 100 percent then P_A is equal to zero percent.

$$E(n) = \frac{0(h_2 - h_1) - h_2}{s - p},$$
$$= \frac{h_2}{p - s}.$$
$$AOQL = \frac{p(k-1)\frac{h_2}{p-s}}{k\left(\frac{h_2}{p-s}\right) + (1-P_A)\frac{h_2}{s}k},$$
$$= \frac{p(k-1)\,h_2}{kh_2 + (p-s)\frac{h_2}{s}k},$$
$$= \frac{p(k-1)}{k + \frac{pk}{s} - k},$$
$$= \frac{k-1}{k/s} = \frac{k-1}{k}s.$$

Formula for 100 Percent Good Lot

Whenever a rejection has occurred, we have found $(h_2 + sn)$ defective units out of n units inspected. Therefore $\frac{h_2 + sn}{n}$ gives the percentage of defective items passing inspection. The factor $\frac{k-1}{k}nk$ gives

the number of items which have passed inspection during sampling which were not inspected. The expected number of defective units which have passed inspection are $\left(\frac{h_2 + sn}{n}\right)\left(\frac{k-1}{k}\right)nk$. The total number of units to stock during sampling and its subsequent 100 percent lot are $(nk + i)$. Of course no defective units go to stock during the 100 percent lot. We desire to hold a specified AOQL $= \frac{k-1}{k}s$. Therefore,

$$\frac{\left(\frac{h_2 + sn}{n}\right)\left(\frac{k-1}{k}\right)nk}{nk + i} = \frac{k-1}{k}s.$$

$$\frac{(h_2 + sn)\ (k-1)}{nk + i} = \frac{k-1}{k}s,$$

$$h_2k + snk = snk + si,$$

$$si = h_2k,$$

$$i = \frac{h_2k}{s}$$

A lot of size $\frac{h_2k}{s}$ must be produced free of defects every time the plotted points reach the rejection line. The above proof again shows that the AOQL is held no matter how frequent the defectives are, or how they are distributed when they reach inspection.

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Statistical Quality Control in The Production of Complex Equipment

MAJOR GENERAL LESLIE E. SIMON

Office Chief of Ordnance, Washington, D. C.

So nigh is grandeur to our dust,
So near is God to man,
When duty whispers low, "Thou must,"
The youth replies, "I can."

—Emerson

THE PROBLEM

At first glance, the application of statistical quality control to the production of complex equipment such as guided missile systems may appear discouraging, if not impossible. Certainly, there is little or no precedent of applications of similar complexity. Let us consider the Army's recently publicized guided missile NIKE, which is designed to protect our armies and our cities by attacking in robot-like fashion and high precision the highest speed, highest altitude enemy aircraft and to destroy them, before they can drop their bombs on the target. This missile system, according to AT&T publications, is manufactured by the Western Electric Company, the Douglas Aircraft Company, and over 1,000 subcontractors in 20 states, and requires approximately 1,500,000 parts in its highly complex control system. The application of statistical quality control to NIKE is made additionally difficult in that the item must give adequate performance (including an acceptable percentage that function properly) under world-wide geographical environments, as well as its self-generated environments ranging from sea level to the thin and frigid stratosphere.

THE ATTACK ON THE PROBLEM

In dealing with highly complex equipment we choose to use the broader term, reliability, rather than the more conventional term, quality control. We choose the former term, not only because it more nearly defines our ultimate goal of economic design and production of systems that have a high probability of functioning as intended (which includes considerations of redesign), but because we wish to make it clear at the outset that we must adapt to our use any applicable techniques, regardless of the field of science or engineering in which they may be found. However, it is astonishing to find how much of this large-scale enterprise consists essentially of the tools which the versatile quality control engineer uses in his daily work.

The Army's belief that missile reliability is susceptible to scientific attack is based, in part, on experience in the application of statistical quality control to Ordnance problems of increasing complexity, since World War II. An outstanding example is our quality control program on the complete round of 105-mm howitzer ammunition. Although the use of process control and sampling inspection plans developed during the early war years resulted in a satisfactory round of ammunition, the size of homogeneous lots was still unsatisfactorily

small, usually of the order of 3000-4000 rounds. After the war, an organized attack on the problem of large uniform lots resulted in the production of lots of uniform complete rounds as large as 150,000 rounds each. The improved quality was not only accompanied by some savings in manufacture, but made possible much larger savings in the use of ammunition in the field. The major part of designing and installing the system of quality control was done under contract by the Quality Assurance Division of the Bell Telephone Laboratories. The work could hardly have been possible earlier because of the incomplete and uneven reception given SQC by industry.

The Army's optimism on the probable success of increasing guided missile reliability through SQC is further predicated on the wartime experiences of United States industry which made it susceptible to further application of statistical concepts. This susceptibility has grown, postwar, along with the general increase in engineering skill and efficiency on the part of our great American industries. The vigor and enterprise of American industry are the real base of our optimism regarding the successful application of the same ideas to our newer Ordnance products which are of complexity never encountered before. The complexity of guided missile systems may, indeed, seem baffling; but both our youthful science of Quality Control in particular, and our youthful American industry in general, will accept the challenge for the reduction of complexity to orderly simplicity as a "must," and reply in the words of Emerson, "I can."

I do not mean to say that optimism regarding the feasibility of reliability in complex equipment gives us license to just muddle through. The solution of the problem of reliability of complex equipment depends upon an orderly, comprehensive attack. First, a complex organizational and management problem is involved. There must be an Army reliability group in the Office of the Chief of Ordnance for policy, planning, general management, and promotion. A similar group is required in the Guided Missile Center, Redstone Arsenal, for the direction of work, analyses, identification of assignable causes of unreliability, correction of deficiencies, and feed-back of information to missile system designers. There must be a reliability group at the Proving Ground, for the inspection and test of missiles as received, for the design of experiment, for planning environmental and flight tests, and for evaluation of performance. These organizational and managerial steps within the Army were taken early and are already paying dividends.

However, much more remains to be done. A very much higher degree of success in the reliability program is possible, and much more economy is possible, if the prime contractors, subcontractors, and components manufacturers make reliable products in the statistical quality control sense, rather than merely screen the product by means of old-fashioned inspection acceptance techniques. In short, industry needs more and better SQC. I would like to give three important and interrelated aspects of the manufacturer's quality control problem which most need prompt attention. I shall classify these as personnel, techniques, and viewpoint.

QC PERSONNEL

Quality Control, unlike mere inspection, is not merely a matter of techniques. An organizational and management problem is involved. It must be entrusted to capable personnel high in the organizational structure of the company. This statement, if accepted, has two implications; one of importance to the company, and the other of importance to the profession of quality control. First, with respect to the company that is deficient in quality control, it means that it cannot correct the situation merely by urging that the persons in its existing organization become quality control conscious and by plowing-in a few junior quality control engineers at the bottom. It must get itself one or more top-rate quality control engineers (or directors) and must institute a statistical quality control organization which reports directly to top management.

Second, with respect to the quality control profession, the statement means that the profession demands that an individual (if he is to go far) have not only statistical competence but also a high degree of general technical and managerial competence.

Some persons have taken the attitude that SQC is so simple that anyone with an ordinary education can acquire the techniques and carry out successfully a complex program. This just is not so, and has been documented repeatedly. The profession must stop leaning on a few simple tools. It must become aware that it can succeed, like any other profession, only through the all around excellence of its members.

TECHNIQUES

Not only is conventional inspection an inadequate answer to the manufacturer's quality problem, but statistical quality control must be applied in the broad sense of economic control of quality by any useful technique wherever found. In doing so, the quality control engineer generally realizes that the quality of the final assembly is controllable primarily through the control of the subassemblies and individual parts that go into it. However, he may not identify so swiftly the intensity of effort that should be placed on a specific component. The answer is generally an economic one.

Let us examine this idea a bit more closely. Consider an assembly made up of n components, 1, 2 - - n.

Let R_i = the reliability of the i^{th} component.

V = the loss that may be incurred because of failure of an assembly due to a component failure.

Then $R_T = R_1 \times R_2 - - - - R_i - - - - \times R_n$ where R_T is the overall reliability of the assembly. Thus, the loss due to the unreliability is $(1 - R_T)V$.

Assume that through the application of SQC the original reliability R_i is improved to $R_i + \Delta_i$. Then, the new overall reliability of the assembly, R'_T, is:

$$R'_T = R_1 \times R_2 - - - - - - \times (R_i + \Delta_i) - - - - - \times R_n$$

$$= R_T + [R_1 \times R_2 - - - R_{i-1} \times R_{i+1} - - R_n]\,\Delta_i$$

$$= R_T + R_T \frac{\Delta_i}{R_i}$$

Now the loss due to unreliability is

$$\left[1 - \left(R_T + \frac{R_T \Delta_i}{R_i}\right)\right] V$$

The gain is $\left(\frac{\Delta_i}{R_i}\right) R_T V$

This simple formula gives rise to several interesting conclusions. The only one of these four parameters upon

which we can operate is Δ_i. The importance of Δ_i increases as R_i decreases; i.e., if the ratio of Δ_i to R_i is large, we should do something to achieve Δ_i. Also, the importance of Δ_i increases as $R_T V$ increases; and since R_T should be near unity, we may say merely, that if V is large, we should try to achieve Δ_i. Thus, the swiftest "pay-off" inheres in doing something about the worst components, provided they admit of substantial improvement and are associated with the loss of usefulness of valuable assemblies. It is very important to note that one may be justified in incurring an increase in cost of several-fold in a cheap component to increase its reliability, because its failure can result in the waste of a whole and much more valuable assembly; but not nearly such a great ratio of increase in cost may be tolerated for an expensive component, because (1) the absolute cost is greater for the same expected gain, and (2) the added cost raises significantly the value of the assembly.

Before doing very much about improving R_i, one should consider such matters as redundancy; e.g., replacing the i^{th} component with two or more such items in parallel. Thus, n redundancies in the i^{th} component gives rise to a new reliability, R'_i, where,

$$R'_i = 1 - (1 - R_i)^n$$

For the simple case of replacing one component with two in parallel, we have,

$$R'_i = [1 - (1 - R_i)^2]$$
$$= 2R_i - R_i^2$$

Redundancy is not to be recommended as a general solution, especially for guided missiles; but we can demonstrate its potential for improving reliability if we consider an assembly of eleven components in series, ten of which have a reliability of 0.999 and the eleventh of which has a reliability of 0.95. Redundancy might be the best procedure if the component were small and cheap. Duplication of the eleventh component would raise the reliability of the assembly from 0.94 to 0.99, an improvement in level which might be much more expensive to achieve through quality control. The reliability formulas also lead to a somewhat general deduction. For example, we see that in some common electronic parts, it may not be economic to try to get industry to raise its overall level of quality to that necessary for expensive complex assemblies such as guided missiles. Instead, it might be better for the industry to have two classes of the part; one of the quality required for missiles and the other suitable for the radio and TV industry.

Considerations of matters such as these may not seem an integral part of quality control, but they should certainly be part of the work of a quality control engineer who is the responsible manager of a program, if he is to arrive at the best and most economical solution to the reliability problem.

VIEWPOINT OF QUALITY

If the company that makes complex equipment institutes quality control as a management tool, a new and important viewpoint becomes possible. The conventional viewpoint of management in meeting specifications is vertical; i.e., the product is tested at each stage in the assembly and adjusted to meet requirements. At the last stage in the assembly, the product has practically acquired a pedigree comparable to that of a prize-winning pup at a dog show. One can look up the long vertical column through which it has passed and see the degree of perfection with which it has been checked off at each station. Management takes a great pride in system such as this, that yields a final complex assembly that so obviously meets requirements. Management will consider the suggestion of instituting statistical quality control almost as an insult. What is wrong with the system?

The stage inspections and tests insured only that the assembly at hand was correct. It did not assure that the flow of components at any stage were of a satisfactory level and of uniform quality with respect to themselves. In fact, the i^{th} component may have had to be adjusted far from the norm, in order to compensate for the accumulation of tolerances allowed in its predecessors.

It unfortunately happens that we have ever with us a parts replacement problem in items of materiel accepted for Army field use. Complex assemblies, such as guided missiles, have many ills to befall them between the assembly line and their final discharge on their nation-protecting mission. These ills frequently create defects that did not exist at the time of acceptance. Hence, the assemblies must be tested at various times in their lives, and defective parts replaced with spare parts. An exchange of parts, when the parts are not of controlled uniform quality, may be tantamount to a chain reaction that throws a large part of the system out of adjustment.

It is not enough to be able to look up the vertical column and see how the assembly passed inspection at each stage, as each component was added. It is necessary—perhaps even more important—to be able to look across the horizontal row of each component and see if the quality of components is uniform. This is precisely the function of statistical quality control. In short, the vertical viewpoint yields an item which is analogous to the handmade article or selective assembly that was practiced by industry before the modern concept of interchangeability of parts. We must have the parts of all Ordnance materiel interchangeable among themselves, and in complex assemblies this can be achieved effectively and economically only by statistical quality control in assembly, and statistical quality control in the manufacture of the components. The work of the Ordnance Corps in the manufacture of complete rounds of ammunition has shown that this can be done and that it will result both in more economical production and in improved performance.

WHERE WE ARE NOW

The Army's organization for reliability of complex assemblies, including quality control, has been working for some time. Some of our contractors are strongly supporting the program. Both the electronics industry and the Aircraft Industries Association are giving the reliability program much attention, and the Department of Defense is lending great stimulus to the program. Acceptable reliability is a current achievement, but much remains to be done. Statistical quality control as a managerial tool needs to be recognized, adopted, and instituted with authority by more contractors and manufacturers of components. Leading quality control engineers need to recognize the importance of administrative and managerial competence and their obligation to face the total problem of economic quality at every stage in the life of the product with the exercise of all the ingenuity and capabilities of the quality control profession.

Local Section News

". . . BUT NOT FORGOTTEN"

BIRMINGHAM The Executive Committee and members of the staff of the University of Alabama were July luncheon guests in Birmingham. Plans were discussed for a jointly sponsored annual forum or clinic.

DANVILLE -SUNBURY Close to 40 members of the section completed the Quality Control training course conducted at Bucknell University during the past year. Certificates were awarded to these men at the last section meeting.

DELAWARE The Executive Committee meetings held during June, July, and August resulted in the tentative schedule for the coming year. This year's program has been diversified in an attempt to attract even more new members than were gained last year. The clinic sessions, which were an outstanding success last year, will be continued and expanded.

ERIE On July 26 the new crop of officers held a business luncheon at Shugart's Restaurant. Gaps in the program were discussed due to a few of the leads on speakers failing to materialize.

LINCOLN At the June meeting of the Section, a play entitled "Sampling Inspection" written by Miss Bonnie Small was presented. The cast included (left to right) Roy Borgstadt, Dean Luethje, Chet Abrahamson, and Art Pendray.

MICHIGAN A preliminary meeting of the new officers and committee chairmen was held at the Park Shelton Hotel on July 28. Dr. W. D. Baten, newly elected Section Chairman, called upon the officers and committee heads to report on the status of their activities. Also in attendance were representatives of the Wolverine Subsection, who outlined their plans for the new year.

MILWAUKEE At the July 19 meeting of the Planning Committee, the program for the Tenth Midwest Quality Control Conference was finalized. Twenty-one individual clinic sessions are scheduled. One series of five sessions is devoted to quality control in the brewing and malting field. Ten sessions are devoted to general and related SQC applications. A new first for the Midwest Conference is the scheduling of a complete series of five sessions being conducted by some of the pioneer SQCer's; namely, Professors Craig, Burr, Henry, Knowler, Olds, and Wescott. This is really a five star program for the 10th Anniversary.

Two Section Executive Committee Meetings were held in July. The year's program was formulated with many new and interesting speakers. Plans for Ladies' Night, the Christmas Party, and the Annual Social Meeting were also formalized. We are promised a most educational and interesting 10th Anniversary year.

MINNESOTA On Aug. 20 the Section inaugurated its 55-56 program with a social evening at Le Sueur. The evening began with a tour of the Green Giant Co. which is in the middle of its "corn pack." The section helped out by consuming all the "corn on the cob" they could hold. The pile of "cobs" had a normal distribution. Wives also went on the tour and dinner was held at the Le Sueur Country Club. The problems of packing corn, peas, etc., and how the high quality is maintained were explained to the group.

NEW HAVEN The July meeting of the Executive Committee was held at Chairman Bob Callahan's residence in Wallingford. Plans for the coming season were reported on by the various committee members and progress was made in lining up the program.

SOUTHERN CONNECTICUT The July meeting of the Officers and Executive Committee was held at the Manufacturers' Association Office, Bridgeport, July 13. E. W. Demers, newly installed Chairman, was well pleased with the presence of all the committee members. Plans for the coming 1955-56 season were discussed and the members of the section can look forward to a well organized program which will be of benefit and interest to all.

SOUTH TEXAS From the executive meetings of the Section, it is easy to predict a successful year. Chairman Jerrold Moyer distributed organization charts and at the last meeting, plans were almost complete from all officers for the forthcoming year.

WESTERN MASSACHUSETTS The executive committee meeting was held on July 7 at Monsanto Chemical Co., Springfield, with John Hinchen, Chairman, as host. The

important part of this meeting was the discussion and presentation of the program for the 1955-56 season. It was learned that there will be six technical meetings and one social meeting. As soon as the program is printed, it will be ready for distribution to the entire membership of the Section.

WICHITA The Section officers and committee chairmen have met and have their program for the season well formulated, placing emphasis on a program which will interest people in all types of industry who are using QC methods. The program is to be a greatly diversified one affording maximum interest. The membership chairman stated he is desirous for material which would create enthusiasm and spur the enrollment of new members along with the greatest number of renewals possible. The Arrangements Chairman is proceeding with the arrangements for a meeting place which will accommodate a large attendance and fulfill the wishes of the entire Section.

"... CAST THEIR SHADOWS BEFORE"

BIRMINGHAM The opening meeting for the coming year will be held Sept. 22. Dr. William Murray, Head of Southern Research Institute, will present a talk on applications of statistics in general research.

CHICAGO The first meeting of our introductory education series will be held Sept. 22 at Navy Pier. This series is designed for the following three classes of people: first, newcomers to the field of Quality Control; second, persons who are interested in learning new methods and new materials about training personnel in Quality Control; and third, those who want a refresher course in the basic principles of SQC. It is felt that practically everybody now working in QC falls in one of these three classes and, therefore, this series should be extremely good. The kickoff session will be on "Problems of Quality Management."

CLEVELAND A joint meeting with the ASA is planned for Oct. 6. Mr. Harold F. Dodge, Bell Telephone Laboratories, will be the featured speaker. He will present a talk on "Some Experiences in Sampling."

DANVILLE -SUNBURY The schedule for 1955-56 is nearly completed, and will be mailed to section members the first week in Sept. This year's program should prove to be an interesting one. Two joint meetings with the Institute of Radio Engineers and the American Chemical Society are planned in addition to talks by outstanding speakers in the Quality Control field.

ERIE On Oct. 6 W. C. Lesser, Supervisor of Quality Control at General Electric's Waynesboro, Va., plant, will speak on "Cost of Quality." This has been designated as Management Night. The meeting place is undetermined, but members will receive adequate notice. Management Night in the past has always received a large turnout. We hope the membership will get the meeting habit early in the season.

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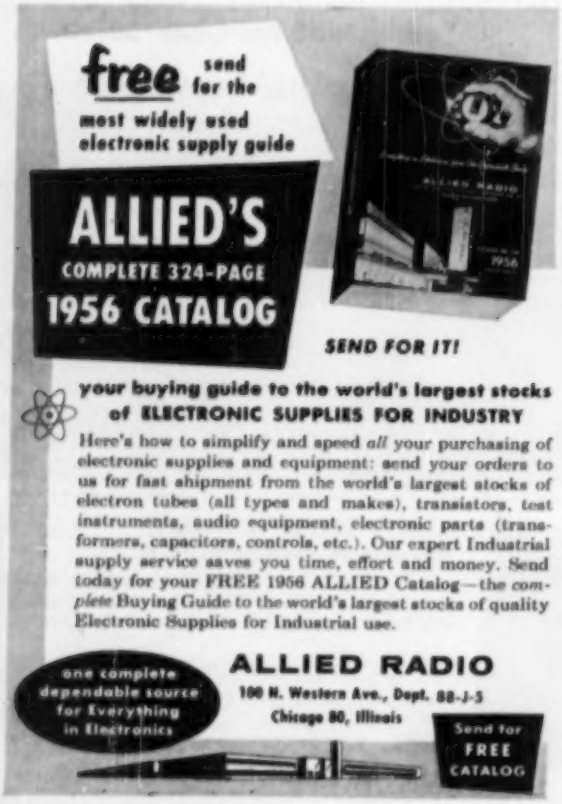
GREATER MUSKEGON The kick-off meeting for the 1955-56 year will be held on Oct. 13 at Bill Stern's Steak House. John G. D. Welch, QC Director at Keller Tool Co., Grand Haven, will speak on "The Practical Side of Control Charts." His desire is to emphasize the proper conductance of a quality control program. Unnecessary charts should be avoided or eliminated and the use of essential charts be made mandatory.

KANSAS CITY The October meeting of the Section will be held at the Blue Hills Restaurant on Wed. Evening, Oct. 12. Following the dinner and business meeting, Glen S. Goodman, Division Head of Production Quality Control of McQuay-Norris Mfg. Co. of St. Louis, will address the section. His subject will be "Quality Control of Automatic Machines."

MICHIGAN The program committee has scheduled a session to finalize the programs for the coming season. It is expected that the fall program will start with an early October meeting in Detroit, but no definite date has been set. The Wolverine Subsection has their opening meeting set for Oct. 7 at Kalamazoo with Upjohn Pharmaceutical Co. as their host. This date has yet to be approved by the parent organization.

MILWAUKEE William J. Youden, National Bureau of Standards, Washington, D. C., will be guest speaker at the Oct. 17 meeting. His subject, "Design of Experiments," is planned to interest the shop man as well as the engineer and chemist. The meeting will be held in the Marquette University Student Union in Milwaukee at 7:45 pm and will be preceded by a buffet supper at 6 pm with lots of that good Amber Fluid (for free) for which Milwaukee is so famous. Come one; come all.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MINNESOTA On Sept. 18 Paul Thompson, Minneapolis Honeywell Regulator Co., will speak to the group on the subject of "Establishing a Quality Program When Dealing With The Manufacture of a Newly Designed Product." The meeting will be held at the University of Minnesota.

MONTREAL First fall meeting has been arranged as a "Forum and Social" type, to be held at the Huzzass Armory on Sept. 21. This meeting is being carefully planned to be a stimulating discussion session, a welcome for new members, and a get acquainted social for all.

NEW HAVEN As a result of the questionnaire submitted to the membership and personal calls made by Bob Callahan to members, the program for the coming season will include clinics, plant tours, local and guest speakers. Dinner meetings are planned for some of the dates.

NORTHEASTERN INDIANA The opening session for the 1955-56 season will be held Thurs., Oct. 13 at the Chamber of Commerce, Ft. Wayne. An interesting feature of the coming season's activities will be a 15 minute "clinical" session preceding the invited speakers discourse. This activity will be conducted each meeting night particularly in the interest of new members and members interested in practical application demonstrations. The discussionists for this activity are being recruited from the membership with representation from all local key industries.

RACINE The first meeting of the new season will be held at the Racine Manufacturers' Association on Oct. 6. R. W. Hanna, Hanna Engineering Service of Rockford, will speak on "Installing a Quality Control Program."

RHODE ISLAND At the first meeting of the season, to be held in September, we will be honored with the presence of Dr. J. M. Juran who will speak on the "Management Phase of Quality Control." All meetings this season will be preceded by "Cliff" Kennedy's Round Table Discussions.

ST. LOUIS The first fall meeting of the Section will be held at the Chouteau House at Washington University on Sept. 16, beginning at 8 p.m. and will be preceded by a social gathering and dinner.

SAN BERNARDINO Dale L. Lobsinger, United Air Lines, Denver, will be the feature speaker at the 1955-56 "kick-off" meeting of the Section to be held in September. Mr. Lobsinger will speak on the subject, "SQC Applied to Administrative Problems."

SEATTLE The regular meeting of the Section will be held Oct. 11 at the Benjamin Franklin Hotel at 7:30 pm. The guest speaker will be Ervin E. Schiesel, Mattatuck Mfg. Co., National Treasurer, ASQC, whose subject will be announced.

SOUTHERN CONNECTICUT The Oct. 12 meeting arranged for by Mel Boyd, Jr., Program Chairman, will have as guest speaker Brent C. Jacob, Jr., Chief Industrial Engineer for Chrys-

ler Div. His topic will be on machine tool capabilities. A 6:30 dinner at the Stratfield Hotel, Bridgeport, will precede the 8:00 meeting.

TORONTO The regular monthly meeting is scheduled for Oct. 12. The guest speaker for this meeting will be H. Wendell, General Electric Co., Cleveland, Ohio.

The Toronto Section has two plant tours scheduled: Sept. 21, P. L. Robertson Mfg. Co., Milton, Ont., manufacturer of socket screws and fasteners; Oct. 19, Anaconda Brass tour for which full information will be given members at a later date.

WESTERN MASSACHUSETTS On Sept. 20, the Section will have their first meeting of the year at the Hotel Sheraton-Kimball in Springfield. Mr. W. A. McCrehan will give a talk relative to "Vendor Quality Evaluation." Dinner is at 6:30 pm with the technical session beginning at 8 pm.

WORCESTER Mr. August B. Mundel, Chief Engineer of the Quality Control Div. of Sonotone Corp., Elmsford, N. Y., will be the speaker at the October meeting in Worcester. He will talk on "What Quality Control Can Contribute to Industry."

"AS YE SOW . . ."

ALLENTOWN -BETHLEHEM Each Monday evening for eight weeks beginning Sept. 26, a training course, "Introduction to Quality Control," will be held at Muhlenberg College, Allentown. The course will be conducted by members of the Section.

BIRMINGHAM Among the speakers at the first annual forum of the University of Alabama and the Birmingham and Huntsville Sections are the following: Dr. Juran, Mr. Arthur Bender (tentative), Professor Robert M. LaForge, and Mr. James C. Sorenson. This one-day forum will be held at the University of Alabama on Oct. 13. All members of ASQC and their guests are invited.

CHICAGO We are repeating last year's successful 16 week course to introduce advance techniques that are useful in the solution of problems arising in the shop and/or research. The course will be devoted to the "how's" of the methods without going too deeply into theory. The text used will be Youden's *Statistical Methods for Chemists*. The starting date for this course is Sept. 27. It is hoped that this year's class will be even better than last year's class of 44 students. Information regarding this course may be obtained from Mae-Goodwin Tarver, Continental Can Co., Research Dept., 4645 W. Grand Ave., Chicago 39, Ill.

DANVILLE -SUNBURY The executive committee is planning two training programs at Bucknell University for the coming year. Information concerning these activities will be presented at the regular meeting in Sept.

MILWAUKEE Irv Schoeninger, Globe-Union, Inc., will teach Elementary SQC at the Evening Technical Div. of the Milwaukee Vocational School with classes beginning Sept. 13.

Dale Cue, A. O. Smith Corp., will teach Statistical Quality Control 384 at the University of Wisconsin Extension Div. in Milwaukee. Classes are scheduled to begin Sept. 20.

MINNESOTA The Section is holding its annual one day clinic on Oct. 6 at the Nicollet Hotel, Minneapolis. Various phases of the problems dealing with Quality Control in the field of Electronics, Office Applications, Vendor Relations, and Process Industries will be covered as well as a General Interest Group. Four sessions in each category will be held during the day. The sessions will be conducted by the Section members with speakers from the Mid-West and the Twin City area.

RHODE ISLAND This Section is sponsoring two Quality Control courses this fall at Brown University. A beginner's course will be conducted by four of the local members, and simultaneously, an advanced course will be given by a prominent instructor in Quality Control. Each course will run for ten weeks.

ST. LOUIS Sept. 24 is an important date on your calendar. This is the day the St. Louis Section has set aside for the Management for Quality Conference at the Jefferson Hotel in downtown St. Louis. Plan to attend.

STATE UNIVERSITY OF IOWA A ten-day intensive training course in Quality Control by Statistical Methods will be offered by the State University of Iowa at Iowa City, Oct. 25-Nov. 4, 1955. This will be an introductory course

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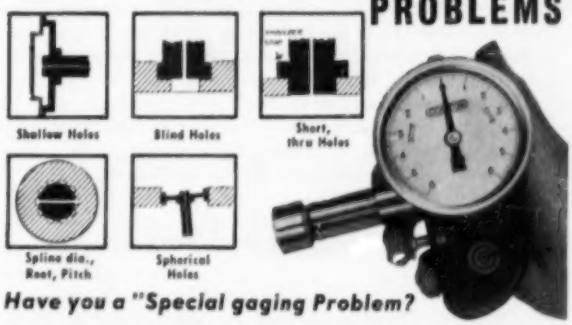

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which will follow the same general pattern of previous basic courses.

Instruction will be by lecture, demonstration, laboratory work, and evening question and problem discussion sessions, with the emphasis on practical interpretation throughout.

The tuition of $100 per person includes all necessary instructional materials. Room accommodations will be available at the Jefferson Hotel in Iowa City. Make room reservations directly with the hotel.

Further inquiries concerning this course should be addressed to Professor Lloyd A. Knowler, Chairman, Department of Mathematics, The State University of Iowa, Iowa City.

SOUTHERN CONNECTICUT The University of Connecticut has announced the Sixth Annual Statistical Quality Control Institute, Sept. 11-23. Southern Connecticut is one of the sponsoring sections with our own Ervin E. Schiesel on the University staff for the course.

SOUTH TEXAS An hour long instructional course will precede Section meetings for the 1955-56 year. In addition, the Section has a listing of available speakers for industrial groups and service clubs. For the monthly meeting beginning in Sept., the Section will have a display of ASQC literature and books for the benefit of further instruction for the new members.

WESTERN MASSACHUSETTS Announcement will be made by this Section relative to an intermediate course in Statistical Analysis which will get under way the latter part of September or early part of October. The course is to be on a college level and in connection with the Massachusetts University Extension. Jack Hinchen, our Chairman, and Carl Bauman, our Secretary, have been certified as qualified by the University Extension to teach the course.

An advanced course in Statistical Analysis will be started in October and before the year is out, an all day work shop relative to sampling will be started. This work shop will be predicated on a new military standard which is to be issued.

INDUSTRIAL MANAGEMENT SOCIETY The Nineteenth Annual Time and Motion Study and Management Clinic sponsored by the Industrial Management Society will be held on Nov. 9-11, at the Sherman Hotel, Chicago. Topflight industrial leaders from all over the U.S. will discuss the latest developments in the fields of time study, motion economy, job evaluation, methods, production, control, plant layout, materials handling, and human relations. Inquiries may be addressed to the Industrial Management Society, 35 East Wacker Drive, Chicago 1, Ill.

"FOR MANY ARE CALLED, BUT FEW ARE . . ."

ALLENTOWN-BETHLEHEM The following are newly elected officers for the coming year: Chairman, D. F. Roberts, Mack Mfg. Corp.; Vice Chairman, R. K. Smeloff, General Electric Co.; Secretary, B. Hammarstrom, Paulsboro Mfg. Co.; Treasurer, D. S. Adams, Western Electric Co.

BOSTON The 1955-56 officers are: Chairman, Harold J. Davis; Vice Chairman, Frances Hermann; Secretary, Harry B. Duane, Jr.; Treasurer, Dorothea Looney.

CHICAGO In the July issue of IQC, Ralph Haertel, past President and Director of the Section, was erroneously listed as Treasurer for 1955-56. David Wadrow was elected to that position.

DANVILLE-SUNBURY The officers for the coming year are: Frank Honicker, Chairman; Fred W. Bernstine, Vice Chairman; J. Harold Backenstoe, Secretary; Kenneth T. Cornelius, Treasurer.

DELAWARE The Section has announced the election of officers for 1955-56 as follows: Chairman, R. G. Mitchell, International Latex Corp., Dover; Vice Chairman, Jim W. Brown, E. I. duPont DeNemours & Co., Wilmington; Secretary, Ed L. Niedzielski, E. I. duPont DeNemours & Co.; Treasurer, T. H. Crommer, Chrysler Corp., Newark.

MONTREAL Elected officers for year 1955-56 for the Section are: Chairman, R. H. Peck, The Steel Co. of Canada, Ltd.; Vice Chairman, E. N. Beckett, The Northern Electric Co., Ltd.; Secretary, R. V. Ward, Canadian Industries (1954) Ltd.; Treasurer, E. C. Longhurst, Sperry Gyroscope of Canada.

NORTHEASTERN INDIANA Chosen to direct the activities for the 1955-56 season are: Chairman, M. G. Pugh, General Electric Co.; Vice Chairman, Don Hensel, Salisbury Axle Co., Div. of the Dane Corp.; Secretary, Otto E. Schlink, International Harvester Co., Treasurer, Paul H. Koogle, General Electric Co.

RHODE ISLAND The officers for the 1955-56 season are: Chairman, Warren Howard, U. S. Rubber; Vice Chairman, Charles S. Maxwell, Coats & Clark, Inc.; Secretary, John F. Hird, Taco Heaters, Inc.; Treasurer, Lester E. Balser, Wire Device Div., General Electric Co.

SEATTLE Officers for the coming year are: Chairman, Charles R. Sheaffer, Stokely-Van Camp, Inc.; Vice Chairman, Berl W. Owens, University of Washington; Secretary, Charles D. Koppa, American-Marietta Co.; Treasurer, Roby M. Burley, Pacific Telephone & Telegraph Co.

SOUTHERN CONNECTICUT New Southern Connecticut Section Officers 1955-56 are: Chairman, Edward W. Demers, Metalix Mfg. Co., Inc., Norwalk; Vice Chairman, Eugene V. Gruman, Bullard Co., Bridgeport; Treasurer, Edgar W. Dawes, Allison Co., Bridgeport; and Secretary, Nicholas Parahus, P. M. Industries, Inc., Stamford.

WORCESTER At the Annual Meeting in May, the following officers were elected: Arthur P. Pingalore, Telechron Dept. of G. E. Co., Chairman; Warren D. Arnold, Jr., Draper Corp., Vice Chairman; Roy P. Leaman, Bay State Abrasive Prods Co., Secretary; Frances Olson, Norton Co., Treasurer.

MEMBERSHIP CORNER

Is your section making full use of the spirit of competition within the section to stimulate membership committee activity? A number of sections have found that this helps to get results and improves their standing in the Section Management Competition for the Saddoris Award. It is an idea quite widely and successfully used by other professional societies in their membership activities.

One scheme for promoting competition within your section is to divide your entire membership into a number of teams. Appoint a captain for each team. Work out a scoring system which will furnish an incentive for the phases of membership activity which you wish to emphasize. You cannot go wrong in following the pattern of the Membership Rules for the Saddoris Award Competition. Keep current scores for each team and keep your members informed of the score as the year progresses. Finally, be sure to include provision for awards for the members of the winning team at the end of the year.

Encourage your teams to broaden their search for new members. The field is as extensive as the applicability of modern quality control methods. The six divisions of the Society represent areas that certainly should be included: Administrative Applications, Aircraft, Automotive, Electronics, Chemical, and Textile.

SIGNIFICANT DIFFERENCES

Professor Richard Hooley, University of Vermont, is spending six weeks as the guest of a Hartford, Conn. insurance company under a fellowship of the Foundation for Economic Education, Inc.

Prof. Hooley, who is chairman of the Technical Committee of the Burlington Section, will observe operations in several departments of the company during his fellowship which is sponsored jointly by the Life Insurance Agency Management Association and the American Association of University Teachers of Insurance.

Howard A. Hall, Danville-Sunbury Section, who was with the Navy Bureau of Aeronautics at Danville, has been transferred to the Bureau's office at Columbus.

Dick Herrick, Erie Section, spoke before the Erie Chapter of AIIE at their May meeting at Gannon College. Dick's topic was "Control Charts—Tool of the QC Engineer." This meeting was used as a springboard for a joint meeting with AIIE during 1955-56.

A concentrated drive, under the guidance of Roland Beyer, Keller Tool Co., will be made during the summer to increase the Kansas City Section's membership 100 percent. Present active membership is 25.

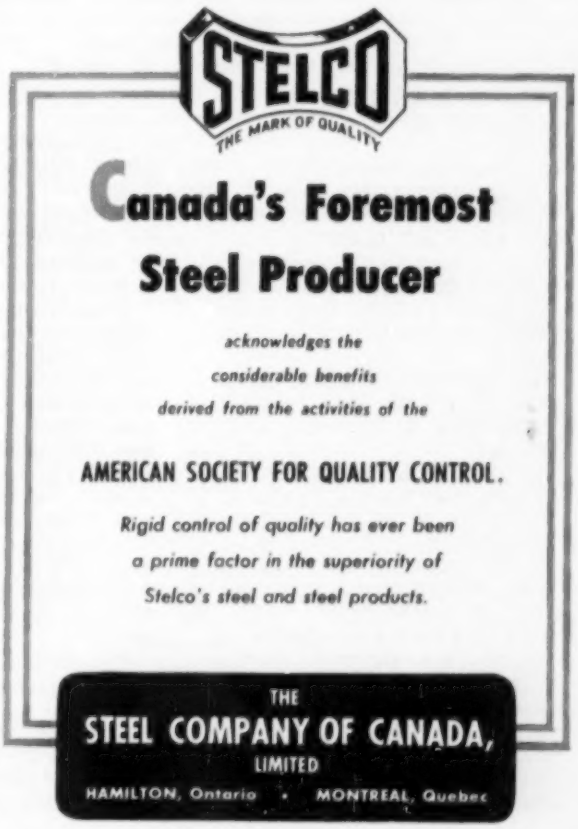
Dr. Leslie W. Ball, Los Angeles Section, has been appointed Technical Director of the United Electro-Dynamic Div. of the United Geophysical Corp.

Two members of the Michigan Section have announced the opening of offices as Quality Control consultants: Walter S. Oliver, formerly of the Detroit Gear Div. of Borg-Warner Corp., is now located at 836 Phosphor Ave., New Orleans, Metaine, La.; J. L. Kidwell, formerly of the Oliver Corp. in Kalamazoo, is located in Augusta, Mich.

In July, some 3000 boxes of book matches were mailed to Midwest ASQC members. The matches, in addition to publicizing the 10th Midwest Conference, had the phrase, "Gemuetlichkeit—At Its Best." Some thought Gemuetlichkeit was a kind of beer; others, an Indian ceremony, and so on . . . For the record, it is a German word meaning Good Fellowship. At the 10th Anniversary Conference in Milwaukee, you'll have Gemuetlichkeit and more too.

The newly appointed chairman of the membership committee of the Northeastern Indiana Section, Mr. L. A. Erickson, is planning his activities on the theory that a large and active committee representing all key industries of the city can and will increase interest in the purposes of the local section from a civic point of view. This committee will make regular "direct" contact throughout the season with members and potential members affording the committee the opportunity it should have to make new contacts for members.

Jordan Engberg, Chairman of the San Bernardino Section, has recently been promoted to the position of Deputy Chief of the Quality Control Office, San Bernardino Air Material Area, Norton AFB. Also Arthur Redelsheimer recently accepted a position as Supervisor of a Research Group with North American Aviation at Downey, Calif.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In the 1955 Yearbook of the Georgia Engineering Society, the ASQC Atlanta Group has been listed in the Directory of Technical Organizations, with Donald S. Holmes, Chairman, of Georgia Institute of Technology, and E. G. Field, Secretary, listed as officers.

This includes the ASQC in the listing of 32 technical activities having members also working in the Georgia Engineering Society.

Gene Witeck, Seattle Section, has accepted a new position with Sandia Corp., Albuquerque, New Mexico. He was formerly Quality Analyst for Boeing Airplane Co., Seattle.

A. H. Morgan, Southern Connecticut Section, has become a Management Consultant, Forbell Drive, Norwalk, Conn. Thomas G. Ragona has taken on a new position at Sikorsky Aircraft, Bridgeport, in their Quality Control Dept.

Mr. Morton Newcomb who, because of illness, has had to retire from engaging actively in QC work, has been made a permanent member of the Society through Executive Action of the Western Massachusetts Section. The Section assumes all Society obligations for Mr. Newcomb in an attempt to repay him in some small way for all his unselfish efforts in founding the Section.

Mr. Ross W. Martin, Birmingham Section, has accepted a new management position with the Glamorgan Pipe Company, Lynchburg, Virginia.

James A. Curry, first chairman of the San Bernardino Section has been named to the newly created post of Supervisor, Statistical Controls, Kaiser Steel Corp., Fontana, Calif.

W. G. Weigel, formerly Chief of Reliability and Process Control at Convair, Pomona Plant, has assumed the position of Chief of Quality Control at the new Ampco Division Plant of American Machine and Foundry at Pomona, Calif.

Dr. N. Gonzalez, formerly Director of Quality Control, Eagle Pencil Co., New York City, has been appointed Director of Research. Dr. Gonzalez succeeds Mr. I. Chesler, recently deceased.

Bibliography

JOSEPH MOVSHIN, *Editor*

Assisted by the Editorial Committee, St. Louis Section, ASQC

On matters concerning the Bibliography Department, send correspondence, suggestions, and contributions to:

Joseph Movshin
9220 Old Bonhomme Road
St. Louis 24, Mo.

APPLICATION—
ELECTRICAL INDUSTRY

ARTICLES ON QUALITY CONTROL
(Transactions of the IRE)
PGQC-3, FEB. 1954

THE PROGRAM ON RELIABILITY OF ELECTRONIC EQUIPMENT—Lewis M. Clement.

REPORT ON U. K. PROJECT TO IMPROVE VALVES FOR MILITARY APPLICATIONS—F. H. Powell.

INSPECTION PROCEDURES FOR MIL-E-1B RELIABLE ELECTRON TUBES—R. J. E. Whittier.

THE PANEL OF ELECTRON TUBES PROGRAM FOR COORDINATING TUBE RELIABILITY ACTIVITIES—L. S. Schwartz.

THOSE UNRELIABLE THERMIONIC TUBES—Walter R. Jones.
PGRC-5, APR. 1955

STATISTICAL DESIGN—A MEANS TO BETTER PRODUCTS OF LOWER COST—Raymond C. Miles.

CONTRIBUTING FACTORS TO COMPONENT PARTS RELIABILITY AND EXTENDED SERVICE—J. A. Goetz.

ACCEPTANCE SAMPLING OF RELIABLE TUBES—Bernard P. Goldsmith.

CATHODE INTERFACE IMPEDANCE DESIMPLIFIED—H. B. Frost.

THE DEFINITION OF TERMS OF INTEREST IN THE STUDY OF RELIABILITY—C. R. Knight, E. R. Jervis, and G. R. Herd.

These two transactions on Reliability and Quality Control (formerly Professional Group on Quality Control) continued the series of IRE Transactions in this area. PGQC-1 was reported in the Bibliography of May 1953. PGQC-2 in the Nov. 1953 Bibliography, and PGQC-4 in the May 1955 Bibliography.

STATISTICAL ANALYSIS OF THE LIFE OF VACUUM TUBES, by S. Takada and S. Shimada
(Hitachi Review—Numbers 6, 7, and 8)

This series of three articles presents a detailed discussion of the application of certain statistical methods to the study of vacuum tubes and life expectancy.

The first part in No. 6, presents a discussion of definitions with regards to life and reliability of vacuum tubes. The basic distribution to be generally considered was presented as expressed by the exponential type. Part two, in No. 7, Oct. 1954, (p. 29-36) describes in some detail the development of sampling inspection plans and operating characteristic curves for what is called a constant number of defectives method, and a constant test time duration method. As indicated, these two methods provide this acceptance criteria for a lot. Detailed mathematics for the sampling plans is presented.

The third part of this series is in No. 8, Jan. 1955, (p. 23-30.) This particular article discusses control charts of the life of vacuum tubes, assuming exponential probability density. A control chart is developed whereby action decisions can be reached. Operating characteristic curves and tables for special control limits are presented, as well as the mathematics of their development. Additional discussion is presented and a consideration of the remaining life of survival of vacuum

tubes. Several types of distributions are considered, in addition to the exponential type. These are the gamma (type F) logarithmic normal (type LN) and the normal (type N.)

(The Hitachi Review is published by Hitachi Ltd., Tokyo, Japan)

ENGINEERING & EXPERIMENTS

ADDITIONAL NOMOGRAPHS FOR SIGNIFICANCE TESTS, by Chou Hsiung Li
(ASTM Bulletin—n. 205, Apr. 1955, p. 46-49)

This article contains several nomographs for evaluating the significance of attribute tests for two large equal samples. Three charts are given for three sample size ranges, 80 to 1,000, 800 to 10,000, and 8,000 to 100,000. Each chart shows four degrees of significance corresponding to a probability of 0.10, 0.05, 0.01, and 0.001.

STATISTICAL DESIGN (STATISTICAL DESIGN DOES NOT NECESSARILY REDUCE THE EXPERIMENTAL ERROR OF COMPARISONS,) by W. J. Youden
(Industrial and Engineering Chemistry—v. 47, n. 2, Feb. 1955, p. 97A)

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This article continues the series on statistical design contained in the "Production Forum" section of every other issue of *Industrial and Engineering Chemistry*. This discussion concerns the transformation of data to study one particular element of variation by minimizing others. This article also discusses the limitations imposed in arriving at decisions with limited data. The need for caution in this area is stressed.

STATISTICAL DESIGN (INDUSTRIAL APPLICATION OF STATISTICAL DESIGN REQUIRES MORE ACTIVE SUPPORT FROM MANAGEMENT,) by W. J. Youden
(Industrial and Engineering Chemistry—v. 47, n. 4, Apr. 1955, p. 107A)

In this article of the series, the author discusses the need for active management support in the application of statistical design. Programs used to inform management of statistical matters are mentioned. Most of these tend to depend on self training by enthusiasts. The need for additional work in providing material on the application of statistical design in the chemical industry is indicated.

STATISTICAL DESIGN (INDUSTRIAL RESEARCH PROBLEMS ARE STIMULATING THE DEVELOPMENT OF NEW STATISTICAL DESIGN TECHNIQUES,) by W. J. Youden
(Industrial and Engineering Chemistry—v. 47, n. 6, June 1955, p. 111A-113A)

This article discusses the need for, and development of new statistical design techniques for particular problems in industry. Starting with the basic statistical designs as used in crop experimentation, the development of additional techniques from Latin squares, etc., to fit industrial problems is briefly traced.

THEORY & APPLICATION—GENERAL

SOME STATISTICAL METHODS FOR EVALUATION OF EXPERIMENTAL RESULTS, by E. W.

NOMINATIONS FOR THE 1954-55 BRUMBAUGH AWARD

In accordance with the provisions governing the Brumbaugh Award, nominations by individual members of ASQC are requested in order to assist the Brumbaugh Award Committee in making its selection. Below is a ballot for your use. Please fill in the ballot and *mail it now.*

In making your selection, please keep in mind that you are to choose the article published in *Industrial Quality Control* that you judge to have made the greatest contribution to the development of industrial applications of Quality Control.

Send your ballot to Halsey H. Kent, Eastman Kodak Company, Camera Works, Rochester 4, New York. All Ballots received up to November 1, 1955 will be accepted.

I recommend that the article written by

.....

and published in the ..... issue

of IQC under the title of .....

.....

be awarded the 1954-55 Brumbaugh Award.

.....

(signed)

The articles which are eligible for this year's award are those that appeared in Volume XI of IQC—July 1954-June 1955.

Check EXTERNAL*

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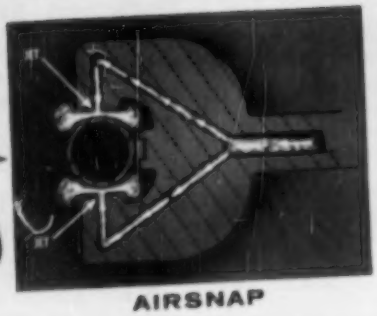

AIRSNAP

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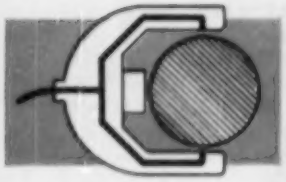

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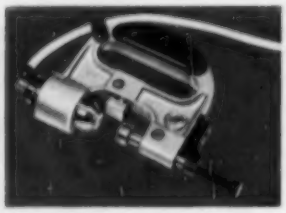

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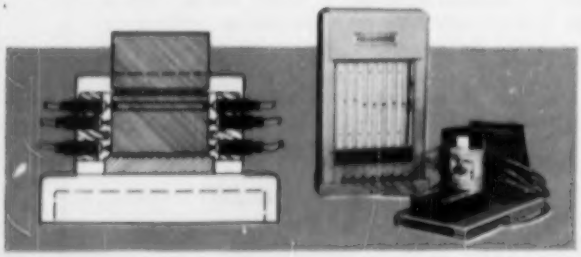

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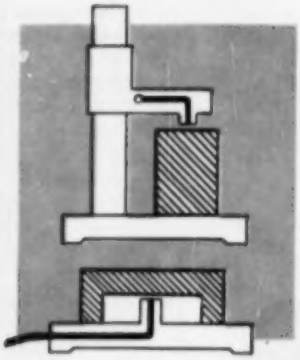
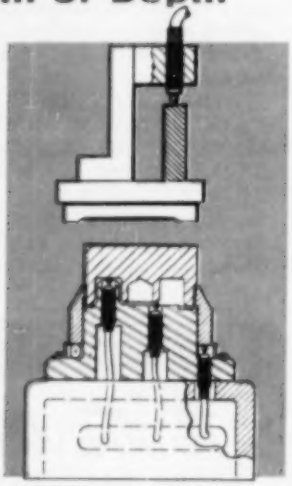
● Air Rings and Air Pots for true diameter, average diameter and out-of-round.

Height, Width or Depth



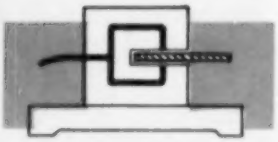
● Gage incorporating one standard jet where tolerance is .005" or less and surface finish is less than 65 rms.



● Gage incorporating one or more Plunjet Cartridges.

● Airetest Indicator.

Thickness



● Gage incorporating two opposed standard jets—especially for thin parts, gage blocks, etc., having close tolerances.

Contour

● Multiple Plunjet Cartridges mounted in a suitable fixture

MORE PRECISIONAIRES BOUGHT THAN ALL OTHER MAKES

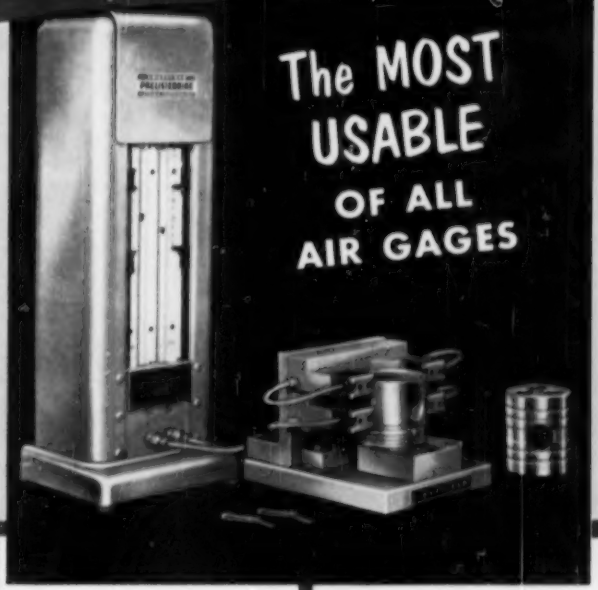
Pike, Radar & Communications Division Raytheon Manufacturing

GRAMS FOR USE IN STATISTICS, by P. Lyle

(American Statistical Association, Journal—v. 49, Dec. 1954, p. 49)

DIMENSIONS and SURFACES

with SHEFFIELD'S PRECISIONAIRE



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High precision with instant response

•

Has widest amplification range—100 to 100,000:1

•

Accommodates widest tolerance range—.000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read—no need to squat and squint

•

Human error minimized

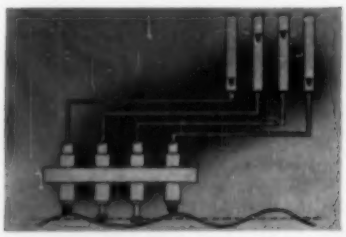
•

Checks one dimension or many simultaneously

•

Elements have long service life

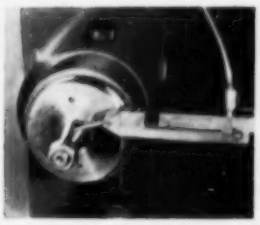
Flatness



● A standard Air Jet or Plunjet Cartridge inserted in a precision surface plate, granite or steel.

● Multiple Plunjet Cartridges mounted in a suitable gage.

Shaft Runout

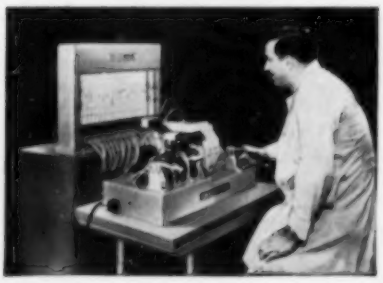


● Airetest Indicator.

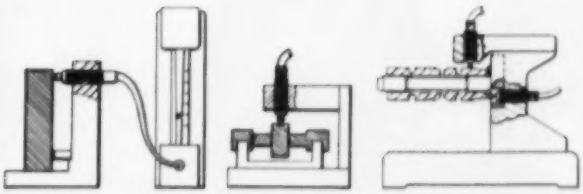
Squareness of Surfaces or Concentricity

● Fixture incorporating one standard jet for close tolerance parts having good surface finish.

Simultaneous Multiple Checking



● As many dimensions as 36 or more are being checked simultaneously to high accuracy on Sheffield Multiple Dimension Precisionaire Gages.



● One or more Plunjet Cartridges mounted in a suitable gage.

* For checking internal dimensions, relationships and countless other conditions, write Instrument Division No. 600, THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.

7221

OF AIR GAGES COMBINED

SHEFFIELD HEADQUARTERS

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MANUFACTURERS AND MEASUREMENT CONSULTANTS

ciency is shown on a separate voltage meter. During the test the upper crosshead of the testing ma-

Pike, Radar & Communications Division Raytheon Manufacturing Company
(Transactions of the ASME—v. 77, n. 4, May 1955, p. 401-3)

This article describes something of the basic logic underlying the application of statistical methods to the evaluation of experimental results. The problem of inferring from a limited sample is noted. The effect of chance in determining results and of the confidence with which one can predict are noted. Statistical Quality Control is indicated as an area in which statistics has contributed to the improvement of product uniformity.

STATISTICS—

CONSTRUCTION OF NOMOGRAMS FOR USE IN STATISTICS, by P. Lyle
(Applied Statistics — v. 3, Nov. 1954, p. 184)

ACCURACY IN STATISTICS, by C. D. Hughes
(Applied Statistics — v. 3, Nov. 1954, p. 146)

DETERMINATION OF SINGLE-SAMPLE SCHEMES FOR PERCENTAGE DEFECTIVES, by G. Horsnell
(Applied Statistics — v. 3, Nov. 1954, p. 150)

CARD GAME WITH BLUFFING, by R. Isaacs
(American Mathematical Monthly —v. 62, Feb. 1955, p. 99)

TEST OF GOODNESS OF FIT, by T. W. Anderson and D. A. Darling
(American Statistical Association, Journal—v. 49, Dec. 1954, p. 49)

EXPERIMENTAL APPROACH IN THE TEACHING OF STATISTICS, by E. G. Olds (American Statistical Association, Journal—v. 49, Dec. 1954, p. 890)

UNSOLVED PROBLEMS OF EXPERIMENTAL STATISTICS, by J. W. Tukey
(American Statistical Association, Journal—v. 49, Dec. 1954, p. 706)

USE OF NORMAL PROBABILITY PAPER, by H. Chernoff and G. J. Lieberman
(American Statistical Association, Journal—v. 49, Dec. 1954, p. 778)

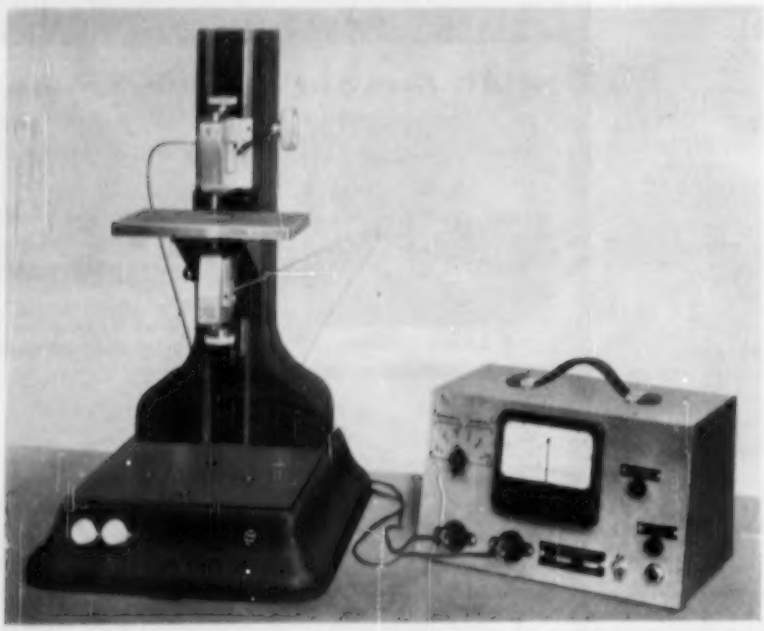
USE OF EXPERIMENTS IN TEACHING ENGINEERING STATISTICS, by I. W. Burr
(American Statistical Association, Journal—v. 49, Dec. 1954, p. 897)

What's New?

ROY A. WYLIE, *Editor*

News releases describing new products and literature should be sent to:
George R. Foster, Mng. Ed.
Room 6123 Plankinton Bldg.
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

When inquiring about "What's New?" items, please mention INDUSTRIAL QUALITY CONTROL.



The Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio, announces the Opposed-Head Micro-Ac electronic micro-comparator for checking gage blocks to millionths or half-millionths of an inch with consistent repeat readings within one quarter-/millionth. The instrument consists of two Micro-Ac gage heads mounted on a column of a stand above and below a work table. The upper gage head contacts the work in the usual way, while the lower gage head is inverted and has its tip extending through a hole in the table to contact the underside of the work. "Wringing" the work to an anvil is eliminated by this direct calipering of the gage block. The gage heads are connected to an amplifier which has a meter that shows the deviation of the work from nominal size. Two sensitivities are provided and used interchangeably at will. Scale divisions of 0.000010/0.000001 or 0.000001/-0.0000005 per scale division are available. Corresponding full-scale readings are 0.0002/0.000020 and 0.000020/0.000010 each side of zero. Work thickness up to 8 inches may be accommodated. Two push knobs at the front of the base operate through cables to retract the contact tips about 0.003 inches to facilitate placing parts between the gage heads.

* * *

A specially insulated machine for testing the mechanical-electrical efficiency of insulators is available from the **Tinius Olsen Testing Machine Co.**, 442 Easton Road, Willow Grove, Pa. Insulators for high voltage service are simultaneously tested for mechanical and electrical insulating efficiency. Tensile strength is indicated on the dial of the 120,000 lb. machine while electrical effi-

ciency is shown on a separate voltage meter. During the test the upper crosshead of the testing machine is insulated by permanent apparatus insulators mounted on the four columns of the machine. While a mechanical tensile load is applied to the insulator, high voltage, 60 cycle electricity is applied to the upper crosshead. This electrical charge goes down the rod and over the test insulator to the ground rods. The test is run to destruction of the insulator by either mechanical or electrical failure. Electrical failure is indicated when the pointer on the voltage meter drops to zero. The combination of electrical and mechanical insulation testing in no way affects the use of the tensile tester for other types of normal universal tests.

★ ★ ★

"Laboratory Master" Angle Gage Blocks are now available from the **Webber Gage Co.**, 12912 Triskett Road, Cleveland 11, Ohio. These new measuring standards are certified accurate to ¼ second. The angle blocks are checked for accuracy in a constant temperature of 68 degrees against master blocks which have been calibrated by optical means to an accuracy of 0.1 second. They are

How To Make Gages With Millionths-Accuracy in Minutes!
Use the DoALL Micro-Step Gaging System
Countless Gages including indicating types made with Micro-Step instruments
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INSTRUMENTS

designed for use as standards of measurement for auto collimators, spectrometers, etc. Each set contains 16 blocks with the following accuracies:

Area of gaging surface—1 x 2 inch

Deviation from marked angle—± 0.25 seconds

Calibration by optical means—± 0.1 second

Accuracy of furnished calibration ± 0.2 second

Flatness—across width—0.000002 inches

across length—0.000002 inches
parallelism of sides—0.000010 inches

Squareness—gaging surface to sides—2 sec.

surface finish—0.5 rms

Optional—chrome carbide optical flat reflecting target

Size—¼ inch thickness, 1¼ inch diameter.

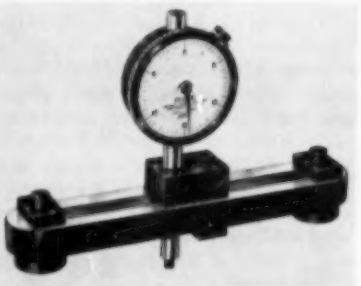
* * *

Boice Manufacturing Co., Inc., Staatsburg, N. Y., has announced the Dial Snap Gage Setmaster, an instrument that can quickly be set to an exact setting, then used to check

a dial indicator snap gage any time the operator desires. It eliminates setting discs and the problem of having them available when needed or the necessity for sending gage blocks into the shop where they are subject to wear and misuse. The Setmaster is readily adjustable, making it ideal for prototype work and short run production. The Setmaster comes in companion units to the Boice Dial Snap Gage. It is set by transferring the dimensions from gage blocks and also serves as a stand to keep the Dial Snap Gage off the operator's work bench.

* * *

Two adjustable Dial Indicator Depth Gages are now being manufactured by **Federal Products Corp.**, 1144 Eddy St., Providence 1, R. I. They will gage a variety of conditions such as slots, holes, recesses, grooves and keyways. Model 75 P-10 will check depths from 0 to 1 inch and 75 P-11 from 1 to 2 inches. Specially shaped contact points and longer contacts are available on request. The dial indicator is easily adjustable vertically within the capacity of the gage and a locking screw assures that it will remain in position. An auxiliary plunger is used to relay the measurement to the indicator spindle. This plunger also protects the indicator spindle from eccentric loads and is keyed to prevent rotation while gaging. Rest pads, adjustable horizontally, are 1 inch in diameter and made of hard-



NEW! IMPROVED SQUARE BLOCK GAGING SYSTEM

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* New accessories extend range of usefulness.

Construct Fixed or Indicating Gages

DoALL's Square Block Gaging System provides easy-to-use accessories for constructing: Indicating gages, multiple gages on one base, scribers, pin gages . . . all gage block accurate!

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Also detects laminar flaws, faulty bonding, etc., in many types of laminated materials, clad metals, bonded materials, plate, strip, and tubing. Send for *Catalog V-101*.

Other products: SONOGEN® Ultrasonic Cleaner; AUDIGAGE® Portable Thickness Gage; COATINGAGE Portable Coating-Thickness Gage.

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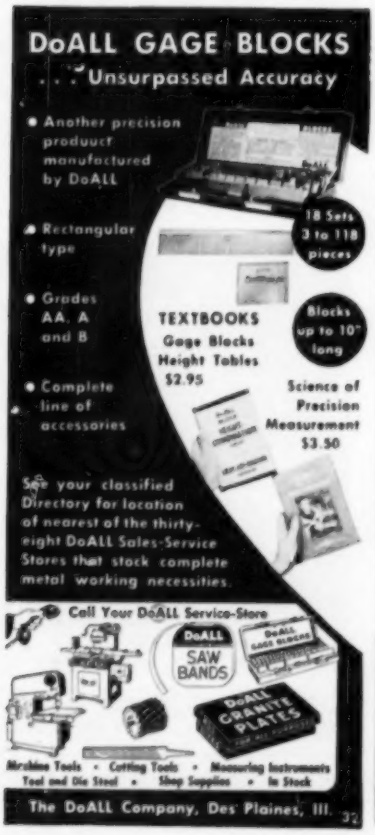
Literature on Request

ened steel, ground flat. The pads may be adjusted from 2¼ to 6 inches center to center. The dial indicator is also adjustable horizontally and may be located anywhere between the rest pads, or, for overhang condition, may be set outside the pads. The indicator can face in any direction so that it will be clearly visible regardless of the position of the gage.

★ ★ ★

Hickok Electrical Instrument Co., 10632 Dupont Ave., Cleveland 8, Ohio, announces the availability of a new portable Stroboflash unit. This instrument is designed for the rapid measurement of speed and the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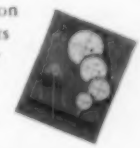

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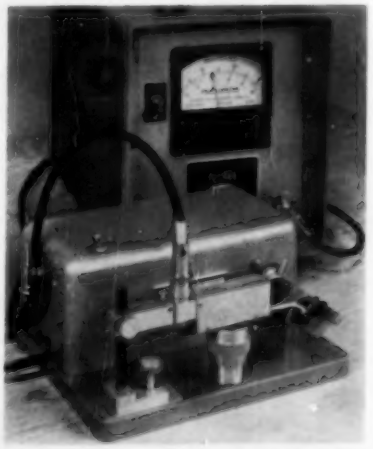
★ ★ ★

W. F. Orth, 800 S. Ada St., Chicago 7, Ill., has introduced a new Rubber Hardness Gage with a second hand that moves with the dial hand and remains at maximum reading until turned counter-clockwise to reset. The device measures rubber hardness instantly and also gives creep reading. It is accurate to ± ½ Durometer point consistently and complies with ASTM specifications for rubber hardness. It is fully jeweled and requires no calibration or adjustment.

★ ★ ★



Micrometrical Manufacturing Co., 345 S. Main St., Ann Arbor, Mich., announces the Type RE Rotary Pilotor for taking Profilometer roughness measurements around surfaces

TABLES OF THE CUMULATIVE BINOMIAL PROBABILITY DISTRIBUTION

By The Staff of The Computation Laboratory of Harvard University

THIS VOLUME extends by more than six times the previously available range of tabulation of the mathematical function which represents the probability that at least r successes will occur in a given number of tries. It is expected that it will be useful to statisticians interested in problems relating to sampling and quality work. Six-decimal-place values are printed.

Professor Frederick Mosteller, in his introduction to this volume, provides a full discussion of seventeen applications of the function, ranging from elementary sampling problems to matching and curve-fitting problems. He also discusses the mathematical background of the function and its relation to certain other mathematical functions that are of interest in the field of statistics and probability. These tables are the first to be computed with the Mark IV Calculator. *Annals of The Computation Laboratory of Harvard University, Volume XXXV.* $8.00

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of rotation on small parts on a production basis. Surfaces of 1/32 to 2 inch radius or more may be measured, depending on the size of the part; tracers can be furnished to reach surfaces in parts of almost any shape. The Pilotor has a spindle that is belt-driven from a gear motor in the Pilotor housing. The workpiece is held in an adapter which in turn is held in the spindle. The adapter locates the center of rotation of the work surface on the axis of the spindle; and the work surface moves past the Tracer point of a stationary Tracer at a speed of 0.1 inch per second. Reciprocating rotation through any desired arc from 10 to 350 degrees is selected by two adjustment rings on the spindle. Continuous rotation is possible. Change pulleys can be furnished to provide the same tracing speed for surfaces of different radius. Full details of the new Pilotor are given in Bulletin LT118 available on request.

★ ★ ★

Federal Telephone and Radio Co., 100 Kingsland Road, Clifton, N. J., are making available the Type RGV Resistance Precision Meter. This instrument has a high accuracy over the range of 1/100 to 100,000,000 ohms. It is completely self-contained and uses no batteries or sensitive galvanometer. Decimal place indication is automatic. Less than 10 mw. power is applied to the sample. Further information is available from the Instrument Division of the manufacturer.

★ ★ ★

Two new 14 inch Screen Optical Comparators are being introduced by **Jones & Lamson Machine Co.**, Springfield, Vt. All lens systems have 6½ inch focal length providing generous clearances in the staging area. Lenses, factory matched and pre-focused, may be mounted singly, or in a six-position turret located in the machine for quick selection of magnifications. Shadow images are erect at all magnifications. Work tables are guided on either ball bearings or scraped ways. Angle measurements are read direct to one minute. Two reflection attachments are available: one provides an acute angle light source at each side of the projection lens for oblique illumination (top photo); the other allows reflection inspection of deep holes, shoulders and polished surfaces (bottom photo). Vertical projection, providing a light source at right angles to the projection tables allow

HALF the world is half asleep! Men who could be making *twice* their present salaries are coasting along, hoping for promotions but doing nothing to bring themselves forcefully to the attention of management.

They're *wasting* the most fruitful years of their business lives . . . throwing away thousands of dollars they may never be able to make up. And, oddly enough, they don't realize—even remotely—the tragic consequences of their failure to forge ahead while time is still on their side.

These are the men who are unknowingly headed for the frustrations and the disappointments of mediocrity. They'll go part way up the ladder and down again by the time they're fifty years old. They'll be executive material in their twenties and thirties—and clerks in their fifties. They'll have high hopes for themselves and their families while they're young; but only struggling, skimping and regret later on when their earning power should be at its height.

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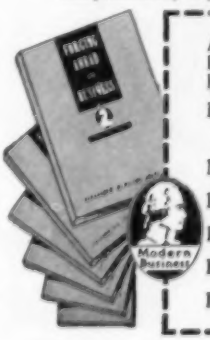

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Grade of Membership	Badge	Price
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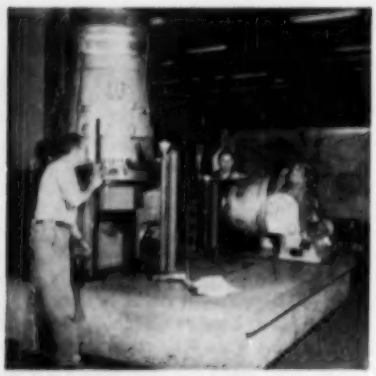
Senior Member	10 K Gold	$3.75
Fellow	10 K Gold with Sapphire	$4.75
Honorary Member	10 K Gold with Diamond	....

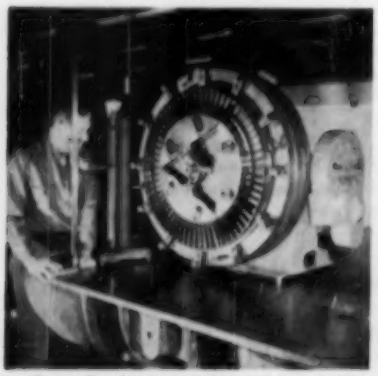
All the above prices include Federal Excise Taxes. Badges may be purchased *only* through local Section Secretaries except for Members-at-Large who may order through the Executive Secretary.

ROTABS Beat Precision Inspection Costs...

This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.

For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

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parts to be staged on a clear glass surface with coordinate travel of 3 x 4 inches. Tracing attachments, for inspecting surfaces that cannot be projected or reflected, are available. Both machines will be on display in the Jones & Lamson Booth #1111 at the NMTBA Show in Chicago, Sept. 6-20.

★ ★ ★

New Literature

A new twelve-page illustrated catalog of Profilometer equipment for shop measurement of surface roughness is available from Micrometrical Manufacturing Co., 201 East Liberty St., Ann Arbor, Mich. Items described are the portable Amplimeter, Tracers for manual and mechanical operation, motor-driven piloting equipment for straight-line, short-stroke and circular tracing, and other accessories.

A combination file folder and brochure describes and illustrates the line of Taperlock, Trilock and Wire Type cylindrical plug gages and thread plug gages available from Sossner Tap and Tool Corp., Lynbrook, N. Y.

INDUSTRIAL QUALITY CONTROL

An Increasingly Better Advertising Medium

For Rates and Space

Address Your Inquiry to George R. Foster, Room 6123, Plankinton Bldg.

161 W. Wisconsin Ave., Milwaukee 3, Wisconsin

Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio, has made available an illustrated folder covering its line of instruments specifically engineered for the textile field. Included is the Brush Lapcheck, a device for measuring longitudinal and lateral weight variations and picker-lap; the Tension Analyzer which measures and records static and dynamic tension levels during routing processing of yarn and roving; and the Brush Imperfection Counter to detect and automatically total the number of imperfections in 100 yards of yarn.

Also available from Brush Electronics is information highlighting the features of the Surfindicator, a versatile gage for surface roughness measurement. It is capable of measuring surfaces from one to 1000 microinches; arithmetic averages are rapidly made. Accessories such as motor drive and special purpose pickups are also described.

POSITIONS AVAILABLE

Address all replies to box number references to: American Society for Quality Control Room 563, 50 Church Street, New York 7, N. Y.

QUALITY CONTROL SUPERVISOR Should have the following background: Engineering degree in electrical or mechanical engineering or equivalent; experienced in planning and implementing quality and engineering investigations and studies on electronic components or equipments; several years of supervisory experience in quality engineering. This job is located in the midwest and is the result of a planned decentralization program by a leading electronic component manufacturer. Our plans include one month orientation and training program at home office prior to move, after which successful applicant will head up quality group for the branch plant. All replies should include resume of professional experience and training as well as salary expected. Please reply to Box 12Q1 at the above address.

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To test-best with mechanical ease, yet assured accuracy, for any given physical property—it is important you have *exactly the right* machine. For more than 40 years Steel City has designed and built the correct machines for various types of work, with the customers' requirements utmost in mind.
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ANNUAL REPORT

of the

BOARD OF DIRECTORS

American Society for Quality Control, Inc.

The Board of Directors of the American Society for Quality Control, Inc., submits herewith its Annual Report covering the fiscal year July 1, 1954-June 30, 1955. This report summarizes the outstanding events of the year and the more important decisions made by the Board and its Operating and Executive Committees as previously reported in the journal, *Industrial Quality Control*.

ANNUAL MEETING

The Annual Meeting of the Society was held at 4 pm on Monday, May 23. The Committee of Tellers was appointed and reported the results of their tabulation of ballots. They reported the election of

Arthur Bender, Jr., President
Julian H. Toulouse, Vice President
Dorian Shainin, Vice President
Leon Bass, Vice President
Dale L. Lobsinger, Vice President
C. E. Fisher, Executive Secretary
E. E. Schiesel, Treasurer

BOARD OF DIRECTORS

The first meeting of the Board of Directors was held on June 10, 1954 at the Hotel Jefferson, St. Louis, Missouri, for the purpose of electing five Executive Directors. The election of the following directors was reported

Dale L. Lobsinger
Ervin E. Schiesel
Clarence R. Burdick
Paul K. Leatherman
Warren R. Purcell

The Board met again on October 20, 1954 at the Hotel Wisconsin, Milwaukee, Wisconsin. An amendment making the selections of the Shewhart Medal and Brumbaugh Award Committees subject to the approval of the Executive Committee was approved. The board reviewed the Society's Investment Fund and approved its continuation. However, to safeguard the funds and maintain control of their investment, an "Investment Fund Operating Procedure" was approved. In essence, this procedure describes the manner in which the Society's funds may be invested, the distribution of bonds and stocks within the portfolio, and establishes the authority delegated to the Financial Advisory Committee.

Upon the death of President Raymond S. Saddoris in November, the Board of Directors passed a resolution noting his many years of service and great contributions to the development of the Society. On behalf of the Board, this resolution was presented to Mrs. Saddoris at the February meeting of the Milwaukee Section by the new President.

By mail ballot in November, the Board of Directors elected the following officers to fill vacancies created by the death of President Saddoris:

Paul A. Robert, President
Dorian Shainin, Vice President
C. E. Fisher, Executive Secretary

A third meeting of the Board was held on May 25 in the Washington Room, Hotel Statler, New York City. At this meeting, the Board reviewed the investment program, the proposed consolidation of national offices, the proposed reorganization of the National Convention administration, approved division status for the Electronics Technical Committee, Automotive Technical Committee, Administration Applications Committee, Aircraft Technical Committee, and discussed plans for the forthcoming year.

The Board of Directors approved a resolution expressing its sorrow at the passing of Colonel Charles D. Wiman, member of the Advisory Council.

EXECUTIVE AND OPERATING COMMITTEES

This committee met five times during the year:

June 10, 1954 in St. Louis, Mo.
October 19, 1954 in Milwaukee, Wis.
January 28, 1955 in Cincinnati, Ohio
March 25, 1955 in New York City
May 22, 1955 in New York City

During the year, these committees met in joint session and the following important actions were taken. Plans were made to encourage the establishment of new divisions. Rules and procedures were put into effect to make it possible for technical committees to achieve division status. Steering committees were set up for the Brewing Industry, Vendor-Vendee Relations, Manufacturing and Assembly, to explore interest in organization in these fields. The Presidential Award for Section Management was renamed the Saddoris Award for Section Management in honor of the late Raymond S. Saddoris. A comprehensive liability insurance policy covering conventions, regional conferences, meetings, offices, officers and employees of the Society was purchased. A plan to reorganize the administration of conventions for central control was approved. Another plan for increasing Technical Committee and Division participation in convention program planning was approved. Plans were started to ultimately affect the consolidation of the Secretary's, Publications, and Treasurer's offices into one National Society office. The journal, *Industrial Quality Control*, was placed on a monthly publication basis starting January 1. Two advertising sales firms were employed to secure additional advertising. During the year, the transition from six to 16 districts was accomplished and the election of new directors was accomplished with a minimum of confusion.

ACKNOWLEDGMENTS

The Board of Directors acknowledges the continued service of the Officers, Executive Directors, Division Chairmen, Technical Committee Chairmen, and Section Chairmen who have carried forward the work of the Society.

In the field of publications, the Board expresses its thanks to the Chairman of the Editorial Board and his associates for the fine journal, *Industrial Quality Control*.

For the many successful conventions in the past and the Ninth Annual Convention, the Board commends the National Convention Committee, the Metropolitan Section and its Convention Committee.

Another year marked by many forward and progressive steps comes to a close with a fine record of accomplishment. The Society is indebted to many individuals who at the expense of personal time and energy, have made this possible.

Endicott, New York
June 30, 1955

For the Board of Directors
PAUL A. ROBERT,
President

Appendix A: Report of the Executive Secretary

Once again the Society has attained a new high in membership, having reached a total of 8780 at the end of the fiscal year. As of June 30, 1954 our membership was 8548; thus we have a net gain of 232 for the 1954-55 year. This is considerably less than the gains for each of the preceding two fiscal years.

Renewals were only 75 percent, as compared with 77 percent for the previous year, and new members totaled 2399, whereas for the 1953-54 year new members totaled 2798. A record of our membership growth is shown in Exhibit "A" of this report. Following is a breakdown of our membership as of June 30, 1955:

	New Members	*Renewing*	*Total*
Fellows	0	190	190
Senior Members	162	1698	1860
Members	2219	4484	6703
Members-In-Training	18	9	27
Totals	2399	6381	8780

During the year there were 279 transfers from one section to another. Approximately one half of these were the result of the establishment of new sections, the other half presumably resulting from relocation of the members involved.

The complete membership breakdown by sections is shown in Exhibit B.

New Sections established during the period July 1, 1954 to June 30, 1955 in the order of recognition are:

	Section No.
South Bend-Mishawaka, (Ind.)	81
San Antonio (Texas)	82
Pittsfield (Mass.)	83
Windsor (Ontario)	84

Chattanooga (Tenn.)	85
Hamilton (Ontario)	86

In addition to the above, the following Sections were established, with an effective date of July 1, 1955:

	Section No.
Corning-Elmira (New York)	87
Tucson (Arizona)	88

Requests for information on formation of new Sections were received from groups at the following locations:

Huntington, West Virginia
Kankakee, Illinois
San Juan, Puerto Rico
Mobile, Alabama

As of June 30, 1955 the Society had on record a total of 736 institutional subscriptions to *Industrial Quality Control*. These subscribers are public libraries and private libraries of industrial organizations in the United States and in many foreign countries.

The office of the Executive Secretary has continued to serve Society members by acting as an employment clearing house for individuals and industry. This program has not been formalized, but the service is available to members, and can be used to supplement the work of Sections and Divisions in this activity. Studies of the coordination of the Society's several placement efforts are still under way.

As a result of the work of the Office Procedures Committee, a number of changes have been effected in methods and procedures for carrying on certain of the business operations of the Society. These have resulted in increased efficiency in the processing of Section remittance reports and in the handling of the sale of technical literature, as well as in improved service to the members. Changes in membership status, changes of address, and other matters directly affecting members are now handled more expediously. This has resulted from the purchase and use of improved equipment, from introduction of changes in procedures and from splendid cooperation on the part of the Section people.

In connection with the preparation of membership cards for the 1955-56 year, arrangements were made to show Division membership for Chemical and Textile Division members. This same indication is included on the dues statement, and the total amount to be remitted will include Division dues. This same procedure will be followed next year for the four new Divisions as well.

Other changes will be put into effect as soon as studies and trials indicate improvements in operation will result.

The Executive Committee authorized the publication of a Yearbook, and accordingly preparations have been under way for several months. The Executive Secretary's office has cooperated with the Yearbook Committee in preparing material for the book. Personal data verification cards were mailed to all members, and returns are being analyzed with the view to providing correct information for the Yearbook.

With the dues statement there are to be cards for use by the members in requesting copies of the book. It is expected that distribution of this book will take place in October.

In order to secure increased work space, the Society's headquarters office was moved in August, 1954 to its present location, Room 563, 50 Church Street, New York 7, New York. This location offers, currently, sufficient room for desk space, files, addressograph equipment, technical publications of the Society, and work areas.

In September, 1954 the staff was increased by one male employee, making a total of four employees in New York. Three of these subsequently resigned and all were replaced. A fifth employee was added to the staff at the end of the fiscal year.

The Executive Secretary acknowledges with thanks the very valuable assistance received from the other officers of the Society following the changes necessitated by the death last November of our President, Raymond S. Saddoris.

Also, the Executive Secretary acknowledges with appreciation the efforts of the headquarters' staff under the direction of Julian S. Herz, Office Manager.

New York, N. Y.
June 30, 1955

C. E. FISHER,
Executive Secretary

Exhibit A—Record of Membership Growth

Date	Members	% Renewal	Net Gain	% Gain	New Members	Active Sections	Members Rec'd. for Following Fiscal Year
June 30, 1947	1926				1926	25	*
June 30, 1948	2102	*	176	9	*	31	*
June 30, 1949	2638	75.2	536	25	1058	35	*
June 30, 1950	3510	76.7	872	33	1489	42	58
June 30, 1951	4245	80.5	735	21	1422	48	167
June 30, 1952	6109	81.2	1864	44	2669	60	207
June 30, 1953	7430	75.0	1321	22	2846	71	146
June 30, 1954	8548	77.4	1118	15	2798	80	254
June 30, 1955	8780	74.7	232	3	2399	86	177

*No Record

Exhibit B—Membership Report 1954-55

	Membership June 30, 1954	Membership June 30, 1955			
	Total	Fellows	Sr. Members	Members	Total
District 1					
Boston	146	5	37	126	168
Buzzards Bay	52		4	41	45
Burlington	42		5	31	36
Hartford	150	2	28	103	133
New Hampshire	19		6	10	16
New Haven	83	1	9	71	81
Rhode Island	57	3	13	63	79
So. Conn.	126	2	25	91	118
W. Mass.	83	4	20	46	70
Worcester	57	1	8	56	65
Pittsfield		1	3	45	49
Total	815	19	158	683	860
District 2					
Albany	127	4	18	57	79
Buffalo	79		23	60	83
Mid-Hudson	115	2	11	88	101
Rochester	130	8	65	50	123
So. Tier	112	1	22	77	100
Syracuse	152	2	22	90	114
Utica	33		7	34	41
Total	748	17	168	456	641
District 3					
Metropolitan	616	28	164	410	602
District 4					
Montreal	80	3	9	74	86
Toronto	92	2	14	105	121
W. Ontario	72		10	40	50
Windsor			8	26	34
Total	244	5	41	245	291
District 5					
Allentown-B.	57	1	6	49	56
Danville-Sunb'y			3	45	48
Erie	46		2	28	30
Harrisburg	80		8	66	74
Lansdale	73	2	8	56	66
Philadelphia	280	5	85	169	259
Pittsburgh	128	4	27	81	112
Scranton-W.B.	46		7	58	65
Trenton	39		7	33	40
Total	759	12	153	585	750
District 6					
Baltimore	115	4	18	107	129
Carolinas	74		10	54	64
Delaware	50	5	7	50	62
Richmond	62		11	33	44
Washington	98	6	21	75	102
Total	399	15	67	319	401
District 7					
Cleveland	354	9	91	194	294
District 8					
Cincinnati	134	2	13	136	151
Columbus	102	2	10	88	100
Dayton	107	4	17	90	111
Parkersburg	33		1	21	22
Toledo	94	2	10	72	84
Youngstown	36	1	6	33	40
Total	506	11	57	440	508
District 9					
Evansville-O.	29		5	30	35
Grand Rapids	70	1	4	40	45
Gr. Muskegon	31		10	16	26
Indianapolis	282	5	46	264	315
Muncie	131	1	10	45	56
N. E. Indiana	68	1	13	34	48
S. Bend-Mish.			4	70	74
Total	611	8	92	499	599
District 10					
Michigan	412	7	68	375	450
District 11					
Chicago	566	14	135	465	614
District 12					
Central Ill.	39	2	20	16	38
Iowa	260	8	61	124	193
Milwaukee	205	3	60	163	226
Minnesota	106	1	27	190	218
Racine	51		17	22	39
Rockford	48	2	8	26	36
Winnebago		1	8	31	40
Total	709	17	201	572	790

District 13					
Denver	49	1	5	30	36
Kansas City	58		9	38	47
Lincoln	48	1	12	27	40
St. Louis	129	7	28	86	121
Wichita	88		27	83	110
Total	372	9	81	264	354
District 14					
Baton R.-N. O.	31		1	24	25
Dallas-Ft. W.	111	1	28	86	115
Mexico City	31		1	29	30
South Texas	61	1	7	50	58
Albuquerque	49	1	10	49	60
San Antonio			4	28	32
Total	283	3	51	266	320
District 15					
Birmingham	39		4	36	40
Georgia	65	2	18	69	89
Huntsville	11		4	17	21
Louisville	68		8	60	68
Tennessee	88	1	15	34	50
Chattanooga			3	24	27
Total	271	3	52	210	295
District 16					
Japan	71		20	52	72
Los Angeles	264	7	102	192	301
Portland	33			31	31
Salt Lake City	28			26	26
San Bernardino		1	6	64	71
San Diego	130		82	40	122
San Francisco	90	3	28	92	123
Seattle	68	1	4	60	65
Total	684	12	242	557	811
Members-at-large	162	1	39	133	173
Members-in-training	37				27
GRAND TOTALS	8548	190	1860	6703	8780

Appendix B: Report of the Treasurer

Herewith are the Statement of Cash Receipts and Disbursements for the fiscal year ended June 30, 1955 (Exhibit C,) the Statement of Income and Expense Versus Budget 1954-55 (Exhibit D,) the Balance Sheet as of June 30, 1955 (Exhibit E,) and the Record of the Marketable Securities held by the Society as of June 30, 1955 (Exhibit F.)

Cincinnati, Ohio
June 30, 1955

LEON BASS
Treasurer

Exhibit C—Statement of Cash Receipts and Disbursements, Year Ended June 30, 1955

CURRENT FUNDS

Receipts			
Membership dues:			
Members in training		$ 69.00	
Regular members		38,887.00	
Senior members		14,826.00	
Fellows		1,175.00	
Overpayments, less refunds		1.25	$54,958.25
Publications:			
Advertising	$24,184.03		
Library subscriptions	4,858.40		
Sales of back issues	1,873.90		
Sales of reprints	56.01	$30,972.34	
Less cost of back issues and reprints		547.07	30,425.27
Sales of conference papers and other technical literature			2,151.61
Sales of membership certificates		$ 69.50	
Less cost of membership certificates		62.05	7.45
Sales of pins and insignia		$ 757.63	
Less cost of pins and insignia		420.60	337.03
Interest received on bank deposits			678.24
Annual Society convention:			
Net income from convention		$10,408.52	
Refund from 1955 Committee		1,500.00	11,908.52
Refund from Technical Committee			500.00
Rental of Society films			77.50
Division dues not transferred as of year-end			149.00
Sustaining contribution and miscellaneous income			112.70
TOTAL RECEIPTS			$101,305.57
Disbursements			
Publications:			
Cost of authors' reprints	$ 1,140.00		
Less cash received from authors	767.40	$ 372.60	
Publishing:			
Magazine	$27,739.72		
News supplement	1,464.00		
Yearbook	748.20	29,951.92	
Postage and mailing expense:			
Magazine	$ 2,285.67		
Back issues	580.85		
News supplement	519.12		
General	411.79	3,797.43	
Salaries			12,077.89
Advertising:			
Commissions and discounts	$ 2,608.37		
Promotion	802.22		
Contract commission—L. B. Hammond	1,800.00		
Contract commission—Weston & Weston	1,350.00		
Sundry	356.04	6,916.63	
Office supplies and expense		2,448.15	
Rent		950.33	
Traveling expense		1,178.63	
Printing and mimeographing		113.35	
Office furniture and equipment		429.15	$58,236.08
Committee and sections:			
Traveling expense:			
Executive		$ 502.83	
Other		35.96	
Printing, mimeographing, and postage		376.24	
Annual report		316.50	
Sundry expenses		841.85	2,073.38
President and Vice President:			
Traveling expenses		$ 85.78	
Office supplies and expense		293.01	
Committee expenses		307.69	686.48
Executive Secretary:			
Secretarial salaries		$15,557.14	
Printing and mimeographing		2,036.97	
Postage		2,300.57	
Office supplies and expense	$ 2,344.81		
Less reimbursement by sections	100.13	2,244.68	
Office rent		2,293.36	
Traveling expense		522.91	
Office maintenance		396.26	
Office furniture and equipment		1,692.51	
Public relations material and technical literature		877.99	27,922.39
Treasurer:			
Secretarial services		$ 1,890.00	
Insurance		375.48	
Professional services		350.00	
Office supplies and expense		50.79	2,666.27
General:			
Transfer to Investment Income Fund		$ 7,998.19	
Pay roll tax expense		472.83	
Allotment to Chemical Division Fund		200.00	
Allotment to Textile Division Fund		200.00	
Advance to 1955 Convention Committee		500.00	
Advance to 1956 Convention Committee		1,500.00	

Payments to Director of Internal Revenue	$ 4,913.39		
Less amounts withheld from employees for income and social security taxes	4,566.73	346.66	
Increase in amounts of imprest petty cash funds		130.06	11,347.74
TOTAL DISBURSEMENTS			$102,932.34
CASH DISBURSEMENTS IN EXCESS OF CASH RECEIPTS			$ 1,626.77
Cash on hand and on deposit at June 30, 1954			35,689.57
Cash on hand and on deposit at June 30, 1955			$ 34,062.80

SPECIAL FUNDS

Administrative Application Division Fund:		
Membership dues received		$ 263.00
Less amount not transferred from General Fund		77.00
Cash on hand for deposit at June 30, 1955		$ 186.00
Aircraft Division Fund:		
Membership dues received		$ 71.00
Less amount not transferred from General Fund		71.00
Automotive Division Fund:		
Membership dues received and on hand for deposit at June 30, 1955		$ 108.00
Electronics Division Fund:		
Membership dues received		$ 258.00
Less amount not transferred from General Fund		1.00
Cash on hand for deposit at June 30, 1955		$ 257.00
Chemical Division Fund:		
Receipts:		
Membership dues		$ 389.00
Allotment from General Fund		200.00
		$ 589.00
Disbursements:		
Printing and mimeographing	$ 279.52	
Postage and telephone	75.39	
Traveling expense	102.65	
Speaker's fee and meeting expenses	20.30	
Office supplies and expenses	4.16	482.02
CASH RECEPITS IN EXCESS OF CASH DISBURSEMENTS		$ 106.98
Cash on deposit at June 30, 1954		304.74
Cash on deposit at June 30, 1955		$ 411.72
Textile Division Fund:		
Receipts:		
Membership dues		$ 320.00
Alotment from General Fund		200.00
Sale of papers		258.95
Clemson conference income	$ 270.50	
Less conference expense	123.89	146.61
Annual conference income	$ 2,008.50	
Less conference expense	1,018.01	990.49
		$ 1,916.05
Disbursements:		
Printing and mimeographing	$ 211.15	
Postage and telephone	52.24	
Traveling expense	65.64	
Technical literature	702.74	
Film strip expense	44.92	
Sundry	2.21	1,078.90
CASH RECEIPTS IN EXCESS OF CASH DISBURSEMENTS		$ 837.15
Cash on deposit at June 30, 1954		381.62
Cash on deposit at June 30, 1955		$ 1,218.77
Brumbaugh Award Fund:		
Interest on bank deposit		$ 53.04
Cash award to D. B. DeLiery		50.00
CASH RECEIPTS IN EXCESS OF CASH DISBURSEMENTS		$ 3.04
Cash on deposit at June 30, 1954		2,050.23
Cash on deposit at June 30, 1955		$ 2,053.27
Saddoris Award Fund:		
Receipts:		
Contribution by Michigan Section		$ 50.00
Interest on bank deposit		1.08
		$ 51.08
Cost of engraving four certificates		60.00
CASH DISBURSEMENTS IN EXCESS OF CASH RECEIPTS		$ 8.92
Cash on deposit at June 30, 1954		92.77
Cash on deposit at June 30, 1955		$ 83.85
Shewhart Medal Fund:		
Interest on bank deposit		$ 20.68
Cost of four medals		147.12
CASH DISBURSEMENTS IN EXCESS OF CASH RECEIPTS		$ 126.44
Cash on deposit at June 30, 1954		935.36
Cash on deposit at June 30, 1955		$ 808.92

Exhibit D—Income and Expense Versus Budget 1954-55

INCOME	*Budget*	*Actual*
Dues—In Training	$ 105.00	$ 69.00
Regular	42,720.00	39,417.00
Senior	14,700.00	14,826.00
Fellow	1,232.00	1,175.00
Total Dues	$58,757.00	$55,487.00
Publications		
Advertising	$27,900.00	$25,124.79
Library Subscriptions	4,650.00	4,087.15
Sale of Back Issues	1,000.00	1,434.70
Sale of Technical Literature	1,500.00	2,276.59
Total Publications	$35,050.00	$32,923.23
Miscellaneous		
Pins, Cuts, Certificates	$ 600.00	$ 396.52
Interest Earned	550.00	678.24
Sundry	300.00	295.33
Total Miscellaneous	$ 1,450.00	$ 1,370.09
TOTAL INCOME	$95,257.00	$89,780.32
EXPENSE		
Publications		
Printing—Magazine	$32,150.00	$27,405.04
Printing—Back Issues	350.00	447.02
Printing—News Supplement	1,100.00	1,166.50
Printing—Article Reprints	250.00	103.05
Printing—Author's Reprints (Net)	650.00	184.63
Yearbook	5,000.00	913.20
Mailing—Magazine and Back Issues	2,875.00	2,866.52
Mailing—News Supplements	500.00	697.31
Advertising Commission	3,335.00	2,608.37
Misc. Advertising Expense	0.00	356.04
Advertising Drawing Account	3,150.00	3,150.00
Business Office		
Salaries	$12,600.00	$11,790.81
Rent	882.00	956.33
Travel	500.00	598.45
Equipment	480.00	429.15
Advertising Promotion	750.00	802.22
Office Expense	950.00	1,174.89
Annual Reports	500.00	316.50

	Budget	*Actual*
Editorial Office		
Office Expense	2,000.00	1,549.66
Travel	600.00	440.46
Total Publications	$68,642.00	$57,947.15
Committee Expense	$ 0.00	$ 87.76
Committee & Sections (Author's Manual)	0.00	376.24
Executive Committee	1,000.00	1,292.88
V. P. Toulouse Committee	425.00	27.72
V. P. Shainin Committee	875.00	448.12
V. P. Bender Committee	1,675.00	205.07
President	250.00	174.77
Vice President	300.00	243.50
Total Committees & Sections	$ 4,525.00	$ 2,856.06
Executive Secretary		
Printing and Mimeo.	$ 2,422.00	$ 2,390.47
Postage	1,476.00	1,826.65
Office Supplies & Expense	591.00	2,012.56
Maintenance of Equipment	318.00	396.26
Salaries	15,480.00	15,207.91
Rent	2,220.00	2,293.36
Travel	900.00	518.47
Equipment	599.00	1,692.51
Total Executive Secretary	$24,006.00	$26,338.19
Treasurer		
Office Supplies	$ 25.00	$ 47.88
Insurance	100.00	375.48
Salaries	1,820.00	1,834.00
Audit Fees	375.00	350.00
Payroll Taxes	500.00	472.83
Total Treasurer	$ 2,820.00	$ 3,080.19
TOTAL EXPENSE	$99,993.00	$90,221.59
NET DEFICIENCY		$ 441.27

Exhibit E—Balance Sheet as of June 30, 1955

ASSETS

Cash:				
Current funds:				
On hand for deposit		$11,100.00		
Demand deposit		3,277.00		
Time deposits—general		13,091.60		
Time deposits—convention reserve fund		6,594.20		
			$34,062.80	
Petty cash funds			224.53	
Special funds:				
Division Funds:				
On hand for deposit:				
Administrative Application	$ 186.00			
Automotive	103.00			
Electronics	257.00			
		$ 551.00		
Demand deposits:				
Chemical	$ 411.72			
Textile	1,218.77	1,630.49		
		$ 2,181.49		
Investment income—demand deposit		1,797.06		
Time deposits:		$ 3,978.55		
Brumbaugh Award Fund	$2,053.27			
Saddoris Award Fund	83.85			
Shewhart Medal Fund	808.92	2,946.04	6.924.59	
Marketable securities (at cost):				$ 41,211.92
United States Treasury bonds (market value $24,402.51)			$24,566.10	
Other marketable securities (market value $52,841.39)			46,975.73	
			$71,541.83	
Less reserve for possible loss from sale of securities			5,000.00	
				66,541.83
Accounts receivable:				
Interfund			$ 149.00	
From sales of advertising, magazine reprints, conference papers, technical literature, etc.			2,250.72	
Advance to 1956 Convention Committee			1,500.00	
				3,899.72
Inventories—at nominal amounts:				
Back issues of Industrial Quality Control conference papers and other technical literature			$ 1.00	
Stationery and supplies			1.00	
				2.00
Office furniture and equipment—at nominal amount				1.00
				$111,656.47

LIABILITIES, RESERVES, AND SURPLUS

Accounts payable—interfund			$ 149.00
Accounts payable—other			966.19
Taxes withheld from employees			576.97
Deferred income:			
Membership dues paid in advance		$ 1,062.00	
Estimated unearned portion of library subscriptions		1,830.25	
			2,892.25
Reserves:			
For Brumbaugh Award Fund		$ 2,053.27	
For Saddoris Award Fund		83.85	
For Shewhart Medal Fund		808.92	2,946.04
Surplus			104,126.02
			$111,656.47

Exhibit F—Marketable Securities as of June 30, 1955

Description	Rate	Maturity	Principal Amount	Cost	Market Value	Income Received During the Year
United States Bonds:						
U. S. Treasury bonds	2⅜%	1957/59	$5,000.00	$ 4,973.75	$ 4,975.00	$ 118.75
U. S. Treasury bonds	2½%	1958	5,000.00	4,978.44	5,015.63	125.00
U. S. Treasury bonds	2½%	1964/69	3,000.00	2,910.31	2,996.25	75.00
U. S. Treasury bonds	2½%	1965/70	2,000.00	2,021.88	1,915.63	50.00
U. S. Treasury bonds	2⅞%	1955/60	9,500.00	9,681.72	9,500.00	273.13
				$24,566.10	$24,402.51	$ 641.88
Other Bonds:						
Aluminum Company of America	3⅛%	2-1-64	2,000.00	$ 1,997.85	$ 2,025.00	$ 62.50
American Tobacco Company	3%	4-15-62	2,000.00	1,963.50	2,005.00	60.00
Baltimore and Ohio Railroad	5%	12-1-95	2,000.00	1,696.00	2,030.00	100.00
Bethlehem Steel Corporation	2¾%	7-15-70	1,000.00	915.80	968.75	27.50
Cincinnati Gas & Electric Company	2¾%	10-1-75	2,000.00	1,839.10	1,900.00	55.00
Cleveland Electric Illuminating Company	3%	7-1-70	2,000.00	2,017.85	2,010.00	60.00
Consolidated Edison Company of New York	3%	11-1-72	1,000.00	963.30	1,000.00	30.00
Dow Chemical Company	3%	7-1-82	4,000.00	4,302.00	4,885.00	90.00
Pacific Gas & Electric Company	3½%	6-1-66	2,000.00	2,057.85	2,080.00	70.00
Pennsylvania Railroad Company	4¼%	4-1-81	4,000.00	3,819.50	4,160.00	170.00
Standard Oil Company of New Jersey	2¾%	7-15-74	2,000.00	1,811.00	1,940.00	55.00
				$23,383.75	$25.003.75	$ 780.00
	Shares		**Par Value**			
Preferred Stocks:						
American Cyanamid Company, cumulative	20	3¾%	$100.00	$ 2,226.35	$ 2,290.00	$ 56.25
Consolidated Edison Company of New York, cumulative	10	$5.00	None	1,094.10	1,110.00	50.00
E. I. DuPont de Nemours and Company, convertible	15	3½%	None	1,392.15	1,473.75	52.52
Chas. Pfizer & Company, Inc., cumulative convertible	10	4%	100.00	1,097.65	1,125.00	20.00
Virginia Railway Company, cumulative	40	6%	25.00	1,159.76	1,280.00	60.00
				$ 6,970.01	$ 7,278.75	$ 238.77
Common Stocks:						
American Smelting & Refining Company	25		None	$ 1,090.40	$ 1,262.50	$ 27.50
American Telephone and Telegraph Company	21		100.00	3,213.14	3,840.38	164.25
Cleveland Electric Illuminating Company	40		15.00	1,051.20	1,470.00	52.00
Commonwealth Edison Company of New York	30		25.00	920.95	1,271.25	54.00
General Public Utilities Corporation	43		5.00	1,104.80	1,585.63	73.12
S. S. Kresge Company	35		2.00	1,196.45	905.63	56.00
National City Bank of New York	25		None	1,334.85	1,521.87	58.75
Norfolk and Western Railroad Company	25		25.00	1,207.32	1,459.38	87.50
Northern Illinois Gas Company	9		5.00	130.22	182.25	1.80
Pacific Gas and Electric Company	30		25.00	1,145.53	1,473.75	66.00
Public Service Gas & Electric Company	50		None	1,387.56	1,568.75	80.00
Standard Oil Company of New Jersey	20		15.00	1,790.54	2,570.00	98.35
Sylvania Electric Products Company	30		None	1,049.01	1,447.50	15.00
				$16,621.97	$20,558.89	$ 834.27
				$71,541.83	$77,243.90	$ 2,494.92

Add:		
Cash on deposit at June 30, 1954	$ 2,606.62	
Proceeds from sale of securities and rights	10,348.00	
Dividends and interest received on securities sold or redeemed	78.28	
Transfer from current funds	7,998.19	21,031.09
		$23,526.01
Deduct:		
Purchase of securities	$21,618.05	
Interest purchased	103.30	
Bank service charges	7.60	21,728.95
Cash on deposit at June 30, 1955—Cleveland Trust Company		$ 1,797.06

Certificate of Audit

We have examined the balance sheet of American Society for Quality Control, Incorporated as of June 30, 1955, and the statement of cash receipts and disbursements for the year then ended, and, without making a detailed audit of the transactions, have examined or tested accounting records maintained by the Treasurer of the Society, and other supporting evidence as hereinafter outlined.

Petty cash funds were reported to us by the custodians of the funds. Current funds on hand for deposit and cash on deposit at June 30, 1955, was reconciled with amounts confirmed to us by the depositaries. We traced the recorded cash receipts for a period of four months, selected by us, to deposits shown by bank statements on file, and examined canceled bank checks, invoices, and other data supporting the recorded disbursements for the same period. We satisfactorily accounted for the recorded cash received for membership dues for the year ended June 30, 1955, by inspection of the underlying records. We also reconciled recorded amounts for sales of advertising and reprints for the year ended June 30, 1955, with amounts reported to us by the Managing Editor of the Society publication.

Marketable securities, held in custody of the Deputy Treasurer, were inspected by us, and we reconciled the reported income therefrom with the cash on deposit which was reported to us by Cleveland Trust Company.

Accounts receivable at June 30, 1955, are included as shown by unpaid invoices on file as of that date, and deferred income is based upon the underlying records.

In our opinion, based upon our examination as outlined above, the accompanying balance sheet and statement of cash receipts and disbursements present fairly the financial position of American Society for Quality Control, Incorporated at June 30, 1955, and the recorded cash transactions of the Society for the year then ended.

Cincinnati, Ohio
July 13, 1955

ERNST & ERNST
Certified Public Accountants

Certificate of Auditing Committee

Ernst & Ernst, Certified Public Accountants, were retained to audit the books of the American Society for Quality Control, Inc. Relying on this audit and the certificate of Ernst & Ernst, we are of the opinion that the accompanying Balance Sheet and Statement of Receipts and Disbursements fairly present the financial position of the Society as of June 30, 1955, and its recorded cash transactions for the fiscal year ending that date.

Auditing Committee.
HOWARD B. BOLTON
G. RUPERT GAUSE
JOSEPH B. SADOWSKI
WALTER W. MERRILL
HOWARD L. JONES, *Chairman*

Appendix C—Report of the Office Procedures Committee

Objective

1. The Committee was activated to study ways and means of arriving at a more efficient, yet economical, conduct of Society affairs particularly in relationship to the activity of our Headquarter's offices in New York City, our publishing office in Milwaukee, and our Treasurer's office.

2. The primary goal in readjusting these organizational elements is to improve service to our general membership and to provide for more effective planning in the expansion of the Society.

Review of Year's Work

Carrying on from the excellent beginning made by previous committees which studied the problem, we sought at once to crystallize basic thinking and to undertake on a specific time schedule the work of affecting needed changes in the Society's organizational structure. This brought forth the following proposals and actions.

1. Our Committee recommended to the Operating and Executive committees at their meeting in New York City on March 26, 1955 that

   A. The Society consolidate at a single location the work of the New York business office, the publishing activity in Milwaukee, and the duties of the Treasurer's office. This work should be undertaken at once with a completion target date of July 1, 1956.

   B. Concomitant with the above, the Society should employ a full time administrative officer to direct and co-ordinate work in A. above—this to be undertaken as soon as possible.

   C. That proposals in A. and B. above be placed before the Board of Directors in their annual meeting May 24, 1955 as a subject of 'intent' and later before the same body during the 1956 mid-year meeting for final approval to proceed as planned.

   D. That necessary constitutional revisions be undertaken where indicated to provide for changes proposed.

2. The Operating and Executive Committees in their meeting of March 26, 1955 approved the proposals under 1. above and authorized our Committee to

   A. Proceed with action to make necessary changes in the Society's constitution for establishing a new consolidated office and employing a paid administrative officer.

   B. Study possible locations for the new consolidated office and recommend a choice.

   C. Determine available qualified candidates for the paid administrative officer assignment.

   D. Prepare job description, including salary scale, for the proposed administrative officer.

   E. Prepare analysis to show economies and improved services which might arise as the result of activating above plans.

   F. Make careful study of income sources for defraying salary expenses of the paid adminstrative officer and place findings before the Operating and Executive Committees.

Summary

Having obtained the approval of the Operating and Executive Committees, the Office Procedures Committee prepared a plan the intent of which was approved by the Board of Directors for consolidating at a single location the three aforementioned Society offices and to procure the services of a paid Administrative officer to coordinate the activity of same. This plan will be set to a time schedule which will permit accomplishment on approximately July 1, 1956.

Members of the Committee

Clarence R. Burdick, Houdaille-Hershey Corp., Detroit, Mich.
Alfred L. Davis, Rochester Institute of Technology, Rochester, N. Y.

For the Committee
DALE L. LOBSINGER
Chairman

Appendix D: Report of Examining Committee

Purpose of Committee

To elect qualified members to FELLOW grade in ASQC and to supervise election to SENIOR MEMBER grade.

Review of Years Work

In the current fiscal year fourteen (14) individuals have been elected to FELLOW grade in the Society. These include: Leo A. Aroian; Carl M. Boswell; Edward P. Coleman; James R. Crawford; R. Shaw Goldthwait; Henry J. Jacobson; Leo J. Jacobson; Roger Lessard; J. Y. McClure; Harry W. Poole; Ervin E. Schiesel; Fred C. Schuize; Majorie L. Sutherland; and Roy G. Volkman.

Two FELLOWS of the Society were lost by death. These were: Ernest L. Fay and Raymond S. Saddoris.

The Society now has 190 FELLOWS, an increase of twelve from a year ago.

As of January 1955, each section was authorized to organize its own section examining committee. Such committees have two duties:

1. To elect SENIOR MEMBERS, and
2. To nominate individuals for consideration for FELLOW grade, supplying the ASQC Examining Committee with supporting information for their consideration.

This change in procedure is making available to the ASQC Examining Committee adequate information for judging the qualifications of prospective FELLOWS.

Members of Committee

Wyatt H. Lewis, General Electric Co., Ontario, Calif.
Robert S. Inglis, Drexel Hill, Pa.
Arthur Bender, Jr., Delco-Remy Div., GMC, Anderson, Ind.
Cecil C. Craig, University of Michigan, Ann Arbor, Mich.

For the Committee
PAUL S. OLMSTEAD
Chairman

Appendix E—Report of Editorial Board

Purpose of the Board

It is the function of the Editorial Board to have operating supervision of *Industrial Quality Control* and all other technical publications of the Society.

Transition to Monthly Publication for IQC

With the January, 1955, Vol. XI, No. 4 issue, the Society began publication of its journal on a monthly basis. This action was implied by the expression of preference reported through the reader survey conducted by questionnaire during Vol. X. It was also supported by a careful study of the relative advertising potential that could be anticipated by shifting from a six issue to a twelve issue basis. It was endorsed by the Editorial Board.

Accordingly, on recommendation of the Operating Committee, the Executive Committee, in August, 1954, authorized publication of *Industrial Quality Control* on a twelve-issue basis to begin with the January 1955 issue. This action was reviewed and approved by the

Board of Directors in October 1954. Except for the Convention (May) issue, the size will be forty pages per issue until authorization for expansion can be justified. With the appearance of the January issue also appeared a new, modified cover design. The design had been previously approved by the Editorial Board and the Executive Committee and was adopted for its ability to give the reader the major contents at a glance.

Retention of Advertising Representatives

On recommendation of the Operating Committee, the Executive Committee also authorized the retention of professional advertising representatives to improve the advertising income for IQC. In accordance with this action, the firm of Weston and Weston in New York City was retained as Eastern Representative and the firm of L. B. Hammond in Chicago was retained as Midwest Representative. Both of these firms were put under contract to ASQC in September 1954.

Change in Advertising Rates

Along with monthly publication, the Executive Committee also authorized an increase in advertising space rates for October 1954. The new rate schedule now in effect appears on page 26 of the March 1955 issue of IQC. This change was made partly to bring IQC space rates in closer line with those of other comparable publications but primarily to keep pace with rising operating and printing costs. On a twelve-issue basis, IQC now has greater value as an advertising medium, especially in view of the growth of the Society and the consequent increase in the potential market for advertisers now reached by the journal.

Other Activities to Strengthen the Advertising Position of IQC.

It was apparent at the outset of the study to shift to monthly publication that such a shift could not be considered unless we could work on and develop corresponding advertising support.

Therefore, in addition to retaining the advertising representatives, a modest portion of the budget was earmarked for promotional activities. Our first and principal effort was the publication on September 15, 1954 of our Sales Presentation prepared in accordance with the recommended outline of the National Industrial Advertisers' Association. This NIAA Presentation gives salient information about IQC in such a manner as to permit direct comparison with other publications by advertisers and agencies. This is our fundamental promotional piece and it is expected that we will keep it up to date by publishing it on an annual basis.

Plans for this year also included a 2/3-page promotional ad in the Annual Marketing Directory and Data number of *Industrial Marketing* which was published in June. Next year we plan to expand this area by using some space in the regular issues of *Industrial Marketing* and also in conjunction with our listing in *Business Publications Rates and Data*.

Operation on a Twelve Issue Basis

It was foreseen by the officers and board that the shift to a monthly publication schedule *whenever made* would be followed by a period of possibly six to eighteen months when advertising income could not be expected to keep in step with the increase in total publication costs. It takes time to work out the adjustments required by a change in both advertising rates and frequency of publication and to develop and secure new business. As was anticipated, there have been both gains and losses, but as of June 30, the net results have been satisfactory, and there is substantial reason to predict that Vol. XII will find the total operation balancing out favorably.

Until such time as IQC can be expanded in size, it appears that space available for publication of articles and other non-advertising copy will be about the same on the monthly basis as it was with the larger sized issue on a bi-monthly basis. Readers will get fewer articles per issue for a while, but they will get their journal twice as often. The ultimate objective, of course, is to render greater reader service by providing a regular monthly issue with both a wider range of advertising copy and a greater volume of technical and editorial content.

One additional full-time man has been authorized and employed in the Milwaukee office to assist in the additional workload imposed on this office by publication of IQC on a monthly basis.

May Issue Advertising

Of the 112 pages of the May 1955 Convention issue, 55 percent was devoted to advertising. The distribution by pages ran as follows: regular advertisers, 11.6 pages; institutional advertisers, 48.3 pages. This was a nine page increase over the 39 pages of institutional advertising in the May 1954 issue.

Data on Volume XI, IQC

Volume XI consisted of three issues at 64 pages, four issues at 40 pages, one issue at 112 pages, and one at 48 pages, plus covers.

An index to Vol. XI was permanently bound as part of the June 1955 issue. A few copies were also published separately to make it available for those desiring loose copies.

Of the 512 pages of Vol. XI, 141.7 were used for paid ads (including classified ads.) In addition, 22 full page ads appeared on the covers of these nine issues. This is about 30.4 percent of the space available in these issues. There is no truly comparable figure for Vol. X. Percent of available space used for paid ads in Vol. XI ran as follows:

July	Sept.	Nov.	Jan.	Feb.	Mar.	Apr.	May	June
22.9%	29.0%	32.0%	41.9%	12.8%	33.5%	16.2%	50.4%	3%

In the nine issues of Vol. XI

185.8 pages were used to publish 48 articles ranging from 1.75 to 8 pages in length.

122.7 pages were required for departmental copy, distributed as follows:

ASQC News:	6 pages; not in the November, January, April, May or June issues.
Bibliography:	20.4 pages total; in each issue.
Book Reviews:	1.5 pages; in July and February only.
Local Section News:	58.8 pages total; in each issue.
Management's Corner:	1 page; in July and February only.
Practical Aids:	9.5 pages; in July, November, February, May, and June issues only.
Problems Department:	3.5 pages; in November, May and June only.
Scrap Box:	2 pages; in September only.
What's New?:	20 pages; in all but January issue.

40 pages were used by annual reports, publicity associated with the Eighth and Ninth Annual ASQC Conventions, editorials, and publicity and informational items of a miscellaneous nature.

8 pages were used for the Index to Vol. XI.

13.5 pages were used for masthead and table of contents display.

News Supplement

The December 1954, Vol. 8, No. 3 issue of this publication was its final issue. With IQC now on a twelve issue basis, the service rendered by the News Supplement has been taken over completely by the Local Section News department which has appeared regularly in each issue of IQC since November 1953.

Reprints

During Vol. XI, 30 orders totaling 18,400 reprints have been handled for contributors. About 34.7 percent of the total cost of these reprints was carried by ASQC under its shared-cost policy for contributor reprints.

Twelve requests for permission to reprint privately articles and other items published in Vol. XI have been received and granted.

Supplementary ASQC Publications

During Vol. XI, ASQC published, as an activity of the Automotive Technical Committee, a 112 page Automotive Supplement No. 1 containing a collection of ten articles of special interest to members in the automotive field. Although carrying a May 1954 publication date, this supplement was not announced for distribution until the July issue. Copies were made available to ASQC members on request until September 30, 1954; thereafter only at $1.50 per copy.

A Cumulative Index covering Vols. I—X of IQC was published separately and distributed to ASQC members and institutional subscribers to IQC as Part II of the June 1955 issue. Articles published in the first ten volumes of IQC have been classified under some 47 topical headings in this cumulative index. Many of the articles are listed in several of these classifications. Authors and contributors are listed alphabetically and cross-referenced to all sections in which articles by them are listed.

Editorial Board

The following men have accepted appointment to the Editorial Board for a five-year term beginning July 1, 1955; A. H. Bowker, A. C. Cohen, Jr., and E. M. Schrock.

Three men retiring from the board as of June 30, 1955 are; Eugene L. Grant, Frank E. Grubbs, and Ellis R. Ott.

Paul C. Clifford has been on active duty in the interests of SQC in Europe since early September 1954. During his absence, Charles R. Hicks (Purdue University) has been acting for Clifford on the Editorial Board.

Manuscripts

As of June 30 the manuscript status was as follows:

Accepted and awaiting publication (Includes accepted Convention articles)	43
In process, i.e. under review by a referee or in the hands of the contributor for revision (Includes Convention articles)	56
Assigned publication credit under the rules of the Saddoris Award for Section Management	7
Rejected or recommended for publication elsewhere (Does not include Convention articles)	14
1954 ASQC Convention Articles: total available	63
Accepted and awaiting publication in IQC	14
Accepted, but revisions by the author still pending	13
Published in Vol. XI through March	5
Rejected for publication in IQC	23
Not reported	8

For the Editorial Board
MASON E. WESCOTT,
Chairman

American Society News

REPORT OF EXAMINING COMMITTEE

The Examining Committee has just announced the election of the following members of the Society to the grade of FELLOW:

Name	Section
William D. Baten	Michigan
Harmon S. Bayer	Michigan
Robert M. Currie	Michigan
David A. Hill	Los Angeles
Fred C. Schulze	Lansdale
Eugene C. Yehle	Michigan
Ervin E. Schiesel	Southern Connecticut
D. H. W. Allan	Hamilton (Ont.)
William Bobalke	Mid-Hudson
Louis P. Marien	Mid-Hudson
Irvin W. Schoeninger	Milwaukee

The Officers of the Society wish to Congratulate these members for achieving this distinction.

OUR EVER-GROWING FAMILY

With the addition of Hamilton (Ont.), Corning-Elmira, and Tucson, the total number of sections of the Society is now 88. The Society is proud to extend a most cordial welcome to the new sections.

86—Hamilton, Ont. (Dist. 4)
Chairman: Majorie M. Baskerville
Dominion Foundries & Steel, Ltd., Hamilton

Vice Chairman: H. E. Markle
Leland Electric Canada Ltd., Guelph

Secretary: C. W. Royal
B. Greening Wire Co. Ltd., Hamilton

Treasurer: A. S. Mitchell
Steel Co. of Canada Ltd., Hamilton

87—Corning-Elmira (Dist. 2)
Chairman: S. John Cherry
Westinghouse Electric Corp.
Elmira

Vice Chairman: Andrew P. Stergion
Corning Glass Works
Corning

Secretary: Paul M. Tice
Eclipse Machine Co.
Elmira

Treasurer: Lewis Garlick, Jr.
Westinghouse Electric Corp.
Bath

88—Tucson (Dist. 16)
Chairman: D. Hawks, Jr.
Hughes Aircraft Co.
Tucson

Vice Chairman: Stanley C. Ceizyk
Hughes Aircraft Co.
Tucson

Secretary: Roy P. Palmer
Hughes Aircraft Co.
Tucson

Treasurer: Jack L. Taylor
Hughes Aircraft Co.
Tucson

DISTRICT REPRESENTATIVES

New district representatives have been announced for the following districts:

District 1
R. Shaw Goldthwait
Collyer Insulated Wire Co.
Pawtucket, R. I.

District 2
Marsh B. Gwynn
Eastman Kodak Co.
50 Main Street
Rochester, N. Y.

District 4
Allin P. Deacon
197 St. George Street
Brantford, Ont., Canada

District 7
John F. Occasione
American Steel and Wire Div.,
U. S. Steel
Rockefeller Bldg.
Cleveland 13, Ohio

District 8
Richard E. Shartle
626 Albany Street
Dayton 1, Ohio

District 9
Russell E. Culy
615 Unbarger Street
Muncie, Ind.

District 11
Ralph Haertel
2604-64th Street
Kenosha, Wisc.

District 13
Ralph D. Humphries
1108 Prairie Park Road
Wichita, Kansas

District 14
James Lee Coburn
4317 Lovell
Fort Worth, Texas

CORRECTION NOTE FROM NORBERT L. ENRICK

A typographical error, appearing in the March 1946 (Vol. II, No. 5) issue of *Industrial Quality Control*, in my article on sequential sampling, has since cumulated itself by reprint in textbooks.

The error occurs in the "Normal Sampling Table" on page 13, where individual sampling plans are given for Acceptable Quality Levels from 0.1 per cent to 12 per cent and for various lot sizes. In particular, the table for AQL of 2 per cent and Lot Size 1300 to 3199, last two lines should have read:

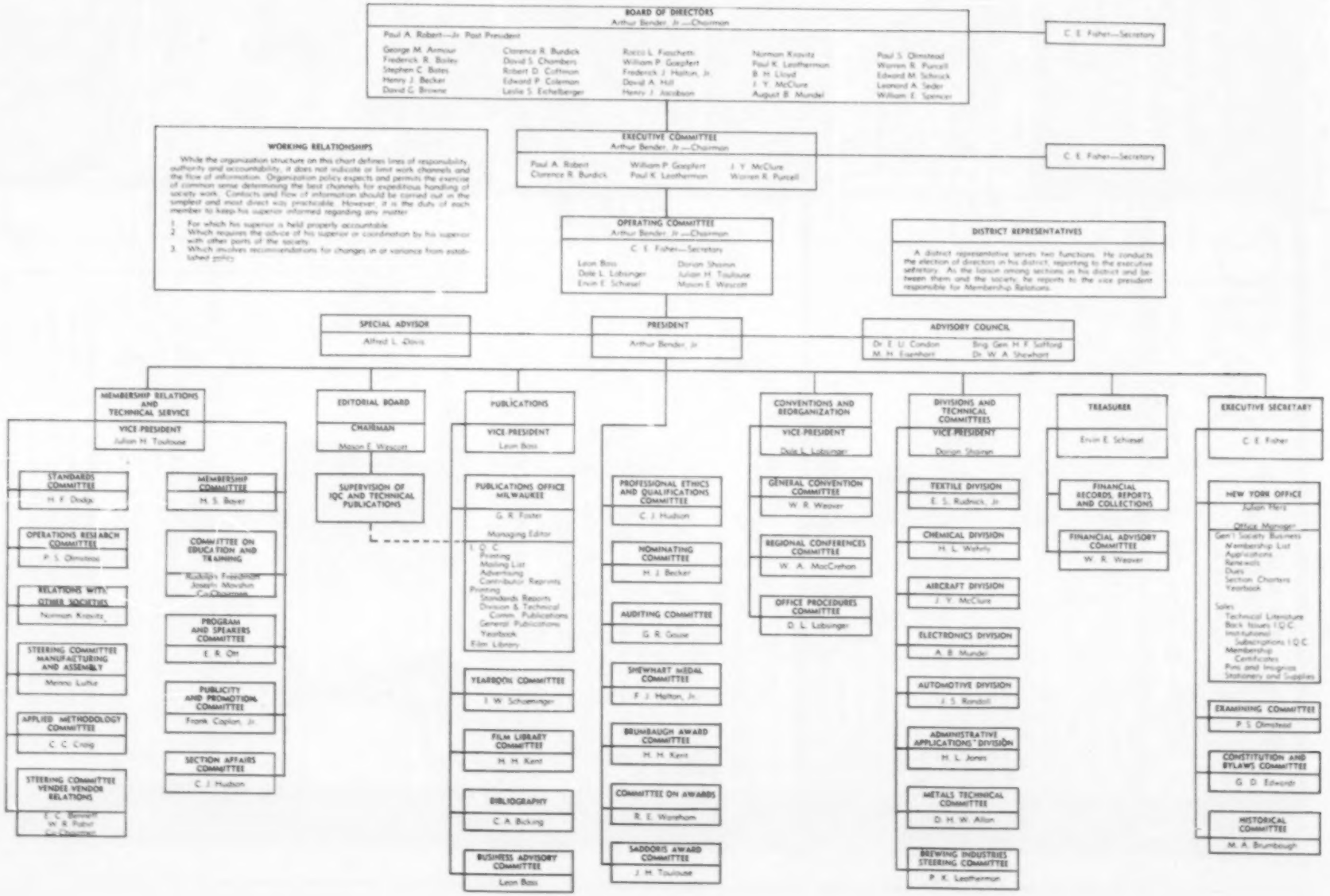
Acceptance Number	*Rejection Number*
4	8
8	9

The figures now appearing (which are in error) are 4 and 6 for the acceptance number and 7 and 7 for the rejection number.

This error then continued into Dr. A. V. Feigenbaum's book *Quality Control* by McGraw Hill and C. Kennedy's *Quality Control Methods* by Prentice Hall, who did not specifically check with me prior to using the master table from the aforementioned article.

Since the master sequential sampling tables appearing in my two books are somewhat different from the aforementioned tables, they do *not* contain this error. This refers to my books *Quality Control* by The Industrial Press and *Quality Control Through Statistical Methods* by Modern Textiles Magazine.

American Society for Quality Control, Inc.
Organization Chart for 1955-56



STOCK LIST
ASQC PUBLICATIONS

Publication	Price
INDUSTRIAL QUALITY CONTROL	
Vols. I-X (July 1944—May 1954)	$6.00 per volume
Vol. XI (July 1954—June 1955)	$9.00 including Index
Individual Back Copies	$1.00
Library Subscriptions (Current volume)	9.00
Subject Index to Vols. I-X	.50
TECHNICAL SUPPLEMENTS SERIES	
Aircraft Supplement No. 1 (14 papers) Bound Volume	1.50
Automotive Supplement No. 1 (10 papers) Bound Volume	1.50
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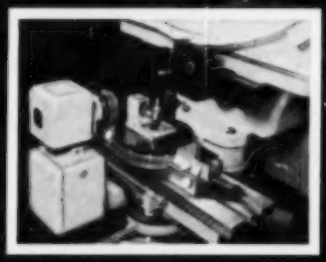

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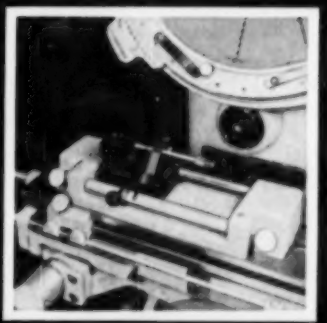

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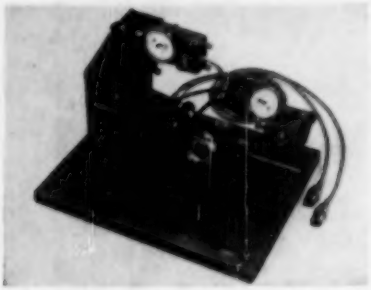

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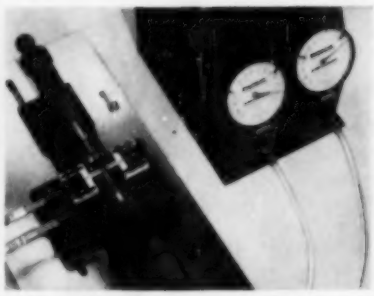

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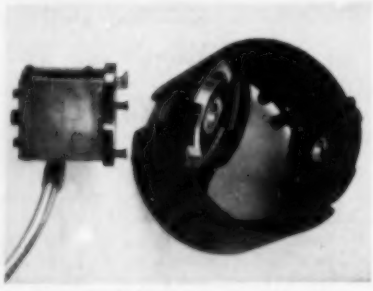

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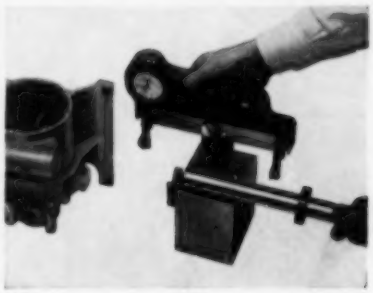
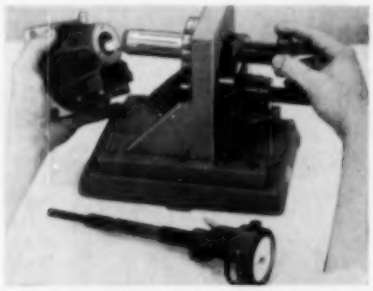


Indicator Gage checks squareness of horizontal bores in relation to vertical bores. Gage shown is being applied to master.



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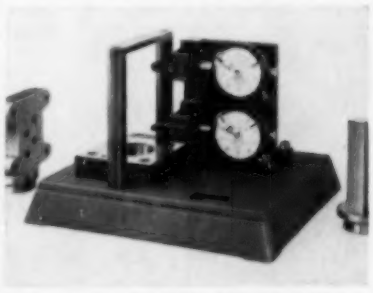

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